

ENTERED

September 16, 2020

David J. Bradley, Clerk

**IN THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF TEXAS
HOUSTON DIVISION**

EXXON MOBIL CORPORATION,

Plaintiff,

v.

UNITED STATES OF AMERICA,

Defendant.

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CIVIL ACTION NO. H-10-2386

CIVIL ACTION NO. H-11-1814

**AMENDED MEMORANDUM AND ORDER ENTERING FINDINGS OF FACT AND
CONCLUSIONS OF LAW**

On August 19, 2020, this court issued a memorandum opinion and order in this case. (Docket Entry No. 344). The court withdraws that memorandum opinion to correct clerical errors, none of which change the court's underlying analysis. This amended memorandum and order supersedes the memorandum and order issued on August 19, 2020.

This is the third, and should be the last, opinion in these environmental pollution cases arising from World War II and the Korean War. In 2010 and 2011, Exxon sued the United States government under the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended, 42 U.S.C. § 9601 *et seq.* ("CERCLA"), seeking reimbursement for some of the costs it paid, and will continue to pay, to remediate environmental damage from producing war materials at its Baytown and Baton Rouge refineries and nearby chemical plants. Deciding the factual issues required the parties and court to examine the years just before World War II up to the present. Deciding the legal issues required the parties and the court to apply relatively recent statutes and legal standards to decades-old events and activities. Instead of live percipient witnesses, the court heard from experts in forensic environmental history and engineering. Instead

of electronic documents, the court examined an archive of contemporaneous prewar, wartime, and postwar correspondence, photographs, and other documents.

The detailed findings and conclusions are set out below. In summary, based on the pleadings, briefs, exhibits, testimony, arguments of counsel, equitable factors, and the applicable law, the court finds and concludes as follows:

During the war years, the full slate of products Exxon produced in connection with making avgas were essential war products. The government exerted substantial control and direction over the refineries' actions, including decisions on how to use raw materials and labor. This control and direction makes the government responsible for a share of the remediation costs, including costs related to the refineries' delays in implementing certain waste-management improvements.

Based on these and other findings made by the court, the following allocation applies:

- At Baytown, the government is liable under CERCLA for an allocated share of 24.67 percent for past response costs incurred at the refinery and 36.54 percent for past response costs incurred at the Baytown Ordnance Works / Tankfarm 3000 Area.
- At Baton Rouge, the government is liable under CERCLA for an allocated share of 14.4 percent for past response costs incurred at the refinery.

Based on the evidence in the record and the parties' stipulations as to costs, the total damage award in favor of Exxon is **\$20,328,670**. For the reasons set forth in greater detail below, these amounts are not subject to an offset for insurance recovery by Exxon because there has been no double recovery.

No later than **August 28, 2020**, Exxon is to submit a proposed final judgment, consistent with the findings and conclusions, after consulting with the government.

The detailed findings of fact and conclusions of law follow.

I. Introduction and Background

A. The Issues

ExxonMobil is a multinational oil and gas corporation that owns numerous chemical plants and refineries, including one in Baytown, Texas and another in Baton Rouge, Louisiana. These refineries date back to the early 20th century, when they were constructed and operated by predecessors to ExxonMobil. In the 1940s, the Baytown and Baton Rouge refineries converted with astonishing speed into aviation gas and synthetic rubber production sites. The conversion was important to the military victory over Japan and Germany. Both refineries operated under wartime contracts with the United States. In both, military needs were given priority over environmental consequences. Those consequences are the basis of these lawsuits.

In 2010 and 2011, Exxon sued the United States government under the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended, 42 U.S.C. § 9601 *et seq.* (“CERCLA”), seeking reimbursement for a percentage of the costs it paid, and will continue to pay, to remediate environmental damage at the Baytown and Baton Rouge refineries and nearby chemical plants under the Resource Conservation and Recovery Act, 42 U.S.C. § 6901 *et seq.* (“RCRA”).¹ The statutes impose environmental standards and allow past owners and operators of facilities where hazardous substances are located to be liable for the costs needed to clean them up and prevent further harm. *See* 42 U.S.C. § 9607.

Two sets of general issues are presented: what amount of the environmental wastes needing remediation are attributable to World War II (and, to a lesser extent, the Korean War); and what

¹ Exxon first brought claims relating to the Baytown refinery in *Exxon Mobil Corp. v. United States*, No. 4:10-cv-2386 (S.D. Tex. July 6, 2010). Exxon then brought claims relating to the Baton Rouge refinery in *Exxon Mobil Corp. v. United States*, No. 4:11-cv-1814 (S.D. Tex. May 12, 2011). The cases were consolidated in August 2011. (Docket Entry No. 63). All citations are to the record in the lead case, *Exxon Mobil Corp. v. United States*, No. 4:10-cv-2386 (S.D. Tex. July 6, 2010).

percentages of that amount should Exxon and the government pay as remediation or response costs? Both sets of questions must be answered for each refinery, for the war years and beyond.

Exxon alleges that, through December 2014, it has incurred approximately \$77 million in past response costs attributable to the wartime-related contamination, and that it will incur significant additional future costs. (*See* Docket Entry No. 261 at 6–10). Exxon’s claims to recover part of the costs at the Baytown facility are governed by § 113(f), 42 U.S.C. § 9613(f). Its claims to recover part of the costs at the Baton Rouge facility are governed by § 107(a), 42 U.S.C. § 9607(a).

In 2009, Exxon filed two contract actions against the government in the United States Court of Federal Claims, seeking recovery for avgas-related environmental cleanup costs based on a reimbursement clause in the World War II avgas supply contracts between Exxon and the government. The clauses required the government to reimburse Exxon for charges incurred “by reason of” the avgas production. *See Exxon Mobil Corp. v. United States*, 101 Fed. Cl. 576 (2011). The contract case in the Court of Federal Claims is stayed, pending resolution of the issues here.

This case was litigated in three phases. The first addressed whether only Exxon or the government, or both, were responsible for the contamination and should pay the cleanup costs. Each party pointed the liability finger at the other. Neither wholly succeeded or failed. In 2015, the court ruled on the parties’ cross-motions for partial summary judgment, holding that:

- the three-year statute of limitations under § 113(g)(2), 42 U.S.C. § 9613(g)(2), applies to Exxon’s claims at Baytown;
- § 113(f)(3)(B)’s contribution provision is Exxon’s exclusive remedy to seek cleanup costs incurred in response to administrative settlements with the State of Texas;
- Exxon’s agreed orders with the State of Texas are “administrative settlements” under § 113(f);
- the refinery and chemical plant at each site are a single “facility” under CERCLA;
- Exxon and the government were CERCLA owners and operators of the chemical plants at both facilities;
- the government was not a CERCLA owner and operator of either refinery; and

- Exxon was entitled to a declaratory judgment that “the United States is liable for its equitable share of past and future cleanup costs incurred at the Baytown and Baton Rouge sites.”

See Exxon Mobil Corp. v. United States, 108 F. Supp. 3d 486 (S.D. Tex. 2015) (“*Exxon I*”). These determinations meant that both Exxon and the government bear a share of the liability for the cleanup costs at the Baytown and Baton Rouge facilities.

In Phase 2, the court determined how to allocate to each party its share of the remediation costs at each site. In 2018, the court ruled on the parties’ cross-motions for partial summary judgment, holding that:

- Exxon’s cleanup costs at the two Baytown Facility Operations Areas were “necessary costs of response” eligible for CERCLA recovery;
- Exxon’s response actions at the five Baytown units and at the three Baton Rouge units were appropriately characterized as a single “removal” action at each facility, which would not be barred by the statute of limitations in 42 U.S.C. § 9613(g);
- Exxon “substantially complied” with the National Contingency Plan for three of the Baytown units and two of the Baton Rouge units;
- a deduction of the insurance-settlement proceeds Exxon received in a different case is appropriate if needed to prevent double recovery;
- the “production-based” analysis is the appropriate equitable allocation methodology to use in this case; and
- Exxon is entitled to a declaratory judgment that it is entitled to recover future cleanup costs associated with the units at which Exxon has already incurred costs.

Exxon Mobil Corp. v. United States, 335 F. Supp. 3d 889 (S.D. Tex. 2018) (“*Exxon II*”).

As part of the holding on the allocation methodology, the court outlined the general steps to determine at the bench trial what amounts each party had to pay. Those steps are:

- assigning shares of waste to the various years of plant operation;
- determining what part of the costs were to clean hazardous wastes caused during the periods of the government’s involvement and are attributable to the production of war products, for which the government is responsible, as opposed to wastes caused by Exxon’s production of nonwar products for commercial sale;
- determining what part of the costs were to clean hazardous wastes caused by the delay in constructing environmental protections at the refineries and plants, and what part of the delay is attributable to Exxon or to the government; and
- assigning the wartime-related costs subject to allocation based on the parties’ respective degrees of involvement with the wartime activities and other equitable factors.

See id. at 941.

The court also outlined the factors it would consider in the equitable allocation of the wartime-related costs. In brief, those factors are:

- the “Gore” factors, which include:
 - (i) the ability of the parties to demonstrate that their contribution to a discharge, release or disposal of a hazardous waste can be distinguished;
 - (ii) the amount of the hazardous waste involved;
 - (iii) the degree of toxicity of the hazardous waste involved;
 - (iv) the degree of involvement by the parties in the generation, transportation, treatment, storage, or disposal of the hazardous waste;
 - (v) the degree of care exercised by the parties with respect to the hazardous waste concerned, considering the characteristics of such hazardous waste; and
 - (vi) the degree of cooperation by the parties with the federal, state or local officials to prevent any harm to the public health or the environment;
- the “Torres” factors, which include:
 - the extent to which cleanup costs are attributable to wastes for which a party is responsible;
 - the party’s level of culpability;
 - the degree to which the party benefitted from disposal of the waste; and
 - the party’s ability to pay its share of the cost; and
- other factors, including:
 - the knowledge and acquiescence of the parties in the contamination-causing activities;
 - the value of the activities to the national defense efforts;
 - the parties’ roles at the refineries and chemical plants;
 - the parties’ intent to allocate liability; and
 - post-war waste handling improvements.

See id. at 944–48.

The court’s Phase 2 opinion also outlined the remaining issues for trial, as follows:

- the allocation of responsibility for cleanup costs at the units on which the parties did not move for summary judgment;
- the allocation of responsibility for the costs at the Facilities Operations Areas;
- the amount by which to offset Exxon’s equitable share of liability based on the North American Coverage Case settlement proceeds;
- the challenges to Exxon’s claimed costs that are not supported by both an invoice and proof of payment;
- whether Exxon may recover prejudgment interest, “run rate” costs, and consultant costs;
- the percentages of wartime production related to “commercial” products;
- the adjustments for Exxon’s post-wartime waste-management improvements;

- the application of the equitable-allocation methodology to determine what amount each party must pay; and
- remaining issues that the pretrial work identified.

Id. at 897.

Phase 3 required a bench trial to resolve the factual disputes and conflicting inferences, and to fix the relative shares of responsibility and the amounts of past costs and the share of future costs that each party must pay.

The bench trial was set to begin in February 2019, but the court granted an extension of time for the parties to pursue a mediated settlement of these and other contaminated sites. In late 2019, the parties told the court that they had not resolved the case and needed to proceed with the bench trial. The parties helpfully stipulated to the remaining cost-accounting issues. (*See* Docket Entry No. 261 at 15–16). The parties also stipulated that the “run-rate” costs Exxon estimated for each site for 2015 to 2019 should be treated as future costs and not included in the court’s quantification of past response costs. (*Id.* at 16). Finally, the parties reached a partial stipulation as to the size of the offset if the court found an insurance offset appropriate. (*Id.* at 16-17).

The remaining Phase 3 issues are:

- the allocation of responsibility for cleanup costs at the various units, including a determination of:
 - the percentages of wartime production related to “war products” as opposed to “commercial” products;
 - the adjustments for Exxon’s post-wartime waste-management improvements; and
 - the application of the equitable-allocation methodology set out in the court’s Phase 2 opinion to determine what amount each party must pay;
- whether an amount offsetting Exxon’s equitable share of liability based on the North American Coverage Case settlement proceeds is needed; and
- whether Exxon may recover prejudgment interest, “run rate” costs, and consultant costs.

A 14-day bench trial was held to resolve the remaining issues.² The parties presented witnesses, cross-examined them, submitted many exhibits, and presented argument. Both sides were thorough and professional in their presentations. Without that, this case would have been even more difficult and complex.

B. The Witnesses and Evidence

Exxon presented the following witnesses:

- Leonard M. Racioppi, the United States manager of ExxonMobil's Superfund portfolio;
- Alfred J. Gravel, a forensic historian and senior managing director at FTI Consulting, Inc.;
- David B. Lerman, a chemical engineer and managing director at FTI Consulting, Inc.;
- Leon D. Paredes, a project-development advisor for ExxonMobil's Environmental Services Company;
- John M. Beath, a chemical engineer, senior technical consultant at John Beath Environmental, LLC, and a former employee of Environmental Resources Management;
- Randall Grip, vice-president of Aero-Data Corporation;³
- Michael E. Pisani, an environmental consultant and engineer for Environmental Resources Management;
- Gregory G. Kipp, a geological engineer and consultant at Verax, Inc.;
- Peter J. Gagnon, a civil and environmental engineer and senior partner at Environmental Resources Management; and

² The bench trial proceeded in two parts because of the COVID-19 pandemic and stay-at-home orders that interrupted the trial and required its completion using technology that permitted counsel, witnesses, and court personnel to participate from separate locations. Exxon presented its case over eight days in early March 2020. All of its witnesses testified and were cross-examined by the government in the courtroom in Houston, Texas. The government began its case on March 18, 2020, presenting one witness for direct and cross-examination, in the same courtroom. The pandemic interrupted and delayed the trial from March 20, 2020, until April 27, 2020, when the government completed its case by presenting three witnesses, who Exxon cross-examined. Exxon then presented a rebuttal witness, followed by closing arguments from both parties.

During the period between the live and remote parts of the trial, the parties worked hard to prepare for an efficient, fair, and thorough presentation of the witnesses, exhibits, and arguments. The court commends the lawyers and their IT staffs for the seamless transition to the remote bench trial. The court finds that the benefits of proceeding far outweighed the harms that would result from a further, indeterminate, and perhaps extended, delay. These consolidated cases have been on file for years. Past delays caused the loss of several witnesses, and required the parties to spend large sums to prepare and then re-prepare, repeatedly. The court finds that the technology allowed a clear, efficient, and thorough presentation of the witnesses and the relevant evidence, and that the remote presentation of part of the proceedings did not infringe on any rights of either party or cause any prejudice.

³ Wayne Grip was originally retained as an expert of the analysis of historical aerial photographs of the Baton Rouge Site. Wayne Grip issued a rebuttal report in 2012 and was deposed in 2013. Because of health reasons, Randall Grip was retained as an expert on the same topics, including his father's report, which he also worked on.

- Richard L. White, an environmental consultant and senior vice president of Nathan Associates.

The government presented the following witnesses:

- Dr. Jay Brigham, a historian and partner at Morgan, Angel & Associates, LLC;
- Mary Sitton, imagery analyst and president of Environmental Research, Inc.;
- Dr. Soni Oyekan, a chemical engineer and owner of Prafis Energy Solutions;⁴
- Matthew Low, an engineer, attorney, and consultant at Matt Low & Associates, LLC.

To say that the exhibits were voluminous is an understatement. The experts—the historians who testified as to where the waste came from, the chemical and environmental engineers who testified about what processes caused the waste, and others—used thick stacks of PowerPoints to lay out their accounts of what caused how much waste, at which location, and when, at each facility. The parties supported their experts’ accounts with primary sources, including contemporaneous documents and aerial photographs showing the facilities at different times.

II. Findings of Fact⁵

A. Background

1. The Refining Process and Wartime Product Production

At its simplest, petroleum refining converts crude oil into more valuable products. Crude oil is a mixture of hydrocarbon molecules, which can be “cracked,” or separated, at different boiling points, creating what refiners call “fractions,” “cuts,” or “runs,” that in turn are combined into different products. A barrel of crude oil can be cracked into a number of products depending on the temperature and distillation process it is exposed to. These products range from butane at the lower boiling point range to asphalt at the higher boiling point range.

⁴ Dr. Soni Oyekan was retained as an expert to replace the government’s previous engineering consultant, Dr. James Kittrell, who for health reasons could not appear.

⁵ Any findings of fact that are also, or only, conclusions of law are so deemed. Any conclusions of law that are also, or only, findings of fact are so deemed.

A central feature of refining is that a refiner will necessarily produce a slate, or range, of refined petroleum products in the process of producing a single refined product—such as avgas—from crude oil. A single barrel of oil cannot make a single barrel of avgas or any other single product. Both Exxon and the government’s refining experts agreed on this point. (*See* P-757 at 8; Docket Entry No. 340-1 at ¶¶ 212–13). This feature is important to the findings and conclusions that during the war years, the full slate of products Exxon produced in connection with making avgas were also essential war products.

The first step in the refining process is to send the crude oil through a distillation column called a pipe still. The pipe still heats the oil and allows the refiner to separate it into fractions based on boiling points. The resulting cuts can then be fractionated further. During World War II, the Baytown and Baton Rouge refineries had installed fluid catalytic cracking units, a secondary conversion tool that results in higher octane cuts, which further distilled the cuts into aviation gasoline-range materials.

The refining process involves complicated chemical reactions requiring both high heat and pressure. Because shutting down and restarting all or part of a refinery requires time and manpower, maximum efficiency requires refineries to operate 24 hours a day, 7 days a week, year round. Dr. David Lerman, one of Exxon’s engineering experts, testified that in his experience as an operations engineer at a major refinery, unit shutdowns to address maintenance issues are planned for every three or four years, spaced so far apart because it can take several weeks to take a unit off line, conduct repairs, and then restart it. (Docket Entry No. 273 at 154). This feature of refineries is important to the findings and conclusions that the government’s emphasis on maximum efficiency in producing avgas and other wartime products required Exxon to defer or

forego maintenance and repairs that would require shutting down all or part of the refinery and related facilities.

Another relevant aspect of the refining process is the choice whether to use crude oil to make intermediate or blending stocks that are in turn used to make a range of refined products, or whether to import already made intermediate stocks from off-site. This aspect figures in determining whether the Exxon refineries were able to minimize pollution by importing pre-prepared intermediates to make avgas or whether Exxon had to prepare the avgas components onsite, which would result in more waste production.

Dr. Lerman described four central functions in refining planning and scheduling. The first is the selection of crude oils, both type and quantity. Next, the refinery must determine what products it will produce from this crude oil, and in what quantity. Third, the refinery must plan the logistics of inputs and outputs. Finally, the refinery must implement steps to provide assurances that the plan is feasible and optimal. (Docket Entry No. 273 at 157–58).

Within the third function, the refinery must plan for waste production and handling. Oil refining is messy. It produces oil, water, and other substances that combine to make toxic sludges and contaminate water flows. These wastes often include chemicals from the refining process, such as acids, lead, and hydrocarbons. Some of these wastes can be characterized as intentional byproducts of the refining process. For example, a fluid catalytic cracking unit produces emulsions of oil and water that must be removed from the equipment during routine maintenance. Other hazardous wastes are better viewed as the product of the more rudimentary refining processes used in the early and mid-twentieth century. For example, refineries would leave oil in open-top tanks that were exposed to the elements. Experts for both sides described sludges that accumulated on the bottoms of the open-air oil tanks from the combination of rainwater, gums, and sediments.

These sludges would be removed periodically and would be sent through the refinery's sewer lines for discharge elsewhere.

Other hazardous wastes are also important to the issues in this phase of the case. One example discussed at length in the bench trial results from the use of "once-through cooling water." To regulate equipment temperatures, refineries pumped water from nearby waterbodies, such as the Houston Ship Channel near Baytown and the Mississippi River near Baton Rouge, to cool the equipment. The water was then sent through the refinery and pumped back into the waterway. This "cooling water" brought silt and other particles into the refinery and picked up oil and chemicals on its way out. Wastes from leaks in corroded or cracked pipes and other unintentional disruptions in the refining process contributed to the production of hazardous wastes. (*See* Docket Entry No. 274 at 15).

The parties differed as to the amounts and types of wastes produced as a result of these and other features of the wartime production at the facilities. These differences divided the parties' positions on the degree of responsibility for the costs of remediating these wastes between Exxon and the government.

2. The Historical Background

This case involves wastes generated during and after World War II. The absence of live eyewitnesses and of detailed records of production going back so far in time required both sides to engage forensic historians. This relatively new discipline is primarily used for litigating disputes like this one. The historians helped assemble and explain records bearing on such questions as what wastes were produced, when, and by whom, and who should bear the costs of remediating what remains.

At the bench trial, both parties called forensic historians to testify. Their testimony addressed the development of the petroleum industry in the 20th century and its role in the defense effort in both World War II and the Korean War. The historians testified about the government's use of its executive and other powers to pressure refinery owners and operators to convert to producing wartime products, and the response of companies like Exxon's predecessors to the mixture of patriotism and pressure. They testified about the government's control over the materials and manpower essential to refinery operations, and the government's involvement in the refineries' operations during the war years. They testified about the inability of Exxon's predecessors at Baytown and Baton Rouge to install pollution controls during the war years, given the government's restrictions on materials and manpower. They also testified about the inability of the refinery operators to make timely repairs or perform routine maintenance because of the government's insistence on having the plants operate 24 hours a day, 7 days a week, year round, and the resulting increase in hazardous wastes.

Exxon called Alfred Gravel, a forensic historian and the senior managing director in FTI Consulting Inc.'s Forensic Litigation and Consulting practice. Mr. Gravel has approximately 25 years' experience as a consultant. He has served as an expert witness in over 20 cases. Mr. Gravel performs forensic history work in both litigation and non-litigation contexts. The court finds that he is a highly credible witness who approaches his litigation work the same way he does for work not performed for litigation.

The government moved to exclude Mr. Gravel's testimony, arguing that he did not qualify as a historical or technical expert under Federal Rule of Evidence 702. (Docket Entry No. 257). The court denied the motion at the joint pretrial conference, and the government renewed its objections during the bench trial. The court again overruled the objection, finding that the concerns

the government expressed bore on the weight, but not the admissibility, of Mr. Gravel's testimony, and that his testimony met the threshold admissibility requirements under Rules 701 and 702 of the Federal Rules of Evidence. The trial made Mr. Gravel's qualifications and expertise even more clear. The government's own environmental historian, Dr. Jay Brigham, praised Mr. Gravel's knowledge and expertise. (*See* Docket Entry No. 296 at 95–96). The court finds that Mr. Gravel was highly credible and reliable.

The government's forensic historian, Dr. Brigham, is the managing partner of Morgan, Angel & Associates, LLC. Dr. Brigham received a bachelor's degree in American history from Linfield College, a master's in American history from the University of Maryland, and a doctorate in American history from the University of California at Riverside. Dr. Brigham has worked for Morgan, Angel & Associates for over 20 years, usually as a testifying or consulting expert on behalf of the government in environmental remediation disputes. Dr. Brigham estimated that over 95 percent of his and his firm's work is on behalf of the government.

Both historians had access to the same historical sources. They agreed on significant points. To the extent they disagreed, the court finds Mr. Gravel's testimony more credible, and entitled to greater weight, than the testimony of Dr. Brigham. The court finds that Mr. Gravel had a superior mastery of the original source documents and that he reached more reliable opinions based on those source documents, as well as other information of the sort customarily relied on by forensic environmental historians. Dr. Brigham relied more heavily than Mr. Gravel on secondary sources. Dr. Brigham's opinions based on the primary sources dating shortly before and after World War II are less detailed than Mr. Gravel's conclusions about the unprecedented scope of federal involvement in, and control of, refining during the war.

Exxon asks the court to organize and consider the evidence in the following periods: the early years of the refineries' work (1910 through mid-1941); the World War II years (mid-1941 through late 1945, also referred to as the "years of government involvement"); the post-World War II and pre-Korean War years (late 1945 through mid-1950); the years of the Korean War (mid-1950 through mid-1953); and the years after the Korean War (mid-1953 through mid-1955). The periods after the Korean War are focused on the government-owned planters at both sites. The government did not object to this chronological organization.

a) Petroleum Refining and Production, 1910 to 1941

In the early 20th century, petroleum refineries primarily focused on the development of gasoline for the automotive industry. The ability to produce 100-octane gasoline emerged in response to the development of bigger, more powerful vehicle engines and the growing requirements of aviation. Petroleum companies, including Standard Oil of New Jersey, the parent company of Standard Oil of Louisiana and a 50 percent owner of the Humble Oil and Refining Company, devoted time and resources in the late 1920s and early 1930s to researching production methods for 100-octane gas. To make the higher octane products, the oil companies had to produce and install new processing plants and machinery at their refineries, including at Baytown and Baton Rouge. (*See* D-1470 at 31–64, 74–101; *see also* P-740 at 83–91). The production capacity was limited by a relatively small market and demand. Consumer car and commercial vehicle demand and needs far outstripped the demand for high octane gasoline products during this period, and the refineries had limited production capability as a result.

In 1935, Standard Oil of Louisiana signed a contract with the Army Air Corps to produce 333,000 gallons of 100-octane gasoline.⁶ In 1938, Humble Oil started operating the first

⁶ These contracts were separate from the contracts between the refineries and the Defense Supplies Corporation for avgas production during the war.

commercial alkylation unit at the Baytown refinery. (D-3026 at 11; P-740 at 46). The continued limited demand for avgas kept the production capacity low. By 1940, national refineries were producing roughly 40,000 barrels of 100-octane gasoline a day, far short of what would be needed the day after Pearl Harbor. (D-1470 at 26; P-740 at 82).

b) Petroleum Refining and World War II

War changed almost everything, including how refineries operated and what they produced. The immediate, urgent, and large need for aviation gasoline for the national defense effort drastically changed the amount of production across the nation. The government encouraged and, in many ways, effectively required, the refineries' private owners and operators to convert as fast as possible to making as much high-octane avgas as possible. By appealing to patriotism, and by making it clear that access to materials and resources needed for refining in general depended on supporting the war effort, the government obtained what it needed—a huge and fast increase in the amount of avgas and other essential wartime products for military use.

Both Mr. Gravel and Dr. Brigham testified to the federal government's expansive carrot-and-stick role in the production of war materials for World War II. The historians largely agreed on the many executive and legislative branch actions to induce and require American industries to participate robustly in the war effort.

In 1941, President Roosevelt created the Office of Petroleum Coordinator and designated Interior Secretary Harold Ickes as the Petroleum Coordinator for National Defense. (P-740 at 20).

President Roosevelt explained that:

[r]ecent significant developments indicate the need of coordinating existing Federal authority over oil and gas and insuring that the supply of petroleum and its products will be accommodated to the needs of the Nation and the national defense program . . . One of the essential requirements . . . which must be made the basis of our petroleum defense policy . . . is the development and utilization with maximum efficiency of our petroleum resources and our facilities, present

and future, for making petroleum and petroleum products available, adequately and continuously, in the proper forms, at the proper places, and at reasonable prices to meet military and civilian needs.

(P-16 at 214–15).⁷

The Office of Petroleum Coordinator recruited its staff primarily from the oil industry and promptly began issuing a number of “recommendations” and “directives” to that industry. (P-740 at 21–22). The recommendations and directives required refineries to prioritize the production of aviation gasoline. For example, Recommendation 8 “restrict[ed] the use of blending agents to the manufacture and production of aviation gasoline.” (*Id.* at 22). Recommendation 23 required refineries to boost the production of alkylate to increase 100-octane aviation gasoline production. (*Id.*). Recommendation 16, issued shortly after the attack on Pearl Harbor, required the petroleum industry to immediately maximize avgas production. (*Id.*). It also authorized the federal government to control the

allocation, exchange, license, pooling, loan, sale, or lease of crude oil, base stocks, blending agents, processes and patents, and production, transportation and refining facilities . . . whenever and to whatever extent may be necessary to facilitate the maximum production of all grades of aviation gasoline or to reduce the time required to produce such gasoline.

(P-23 at A000272).

President Roosevelt established the War Production Board by executive order in 1942. (D-1470 at 13; P-740 at 14–15). The War Production Board was created within the Office for Emergency Management to:

determine the policies, plans, procedures, and methods of several Federal departments, establishments, and agencies in respect to war procurement and production, including purchasing, contracting, specifications, and construction; and including conversion requisitioning, plant expansion, and the financing thereof; and issue such directives in respect thereto as . . . necessary and appropriate.

⁷ Both historians relied extensively on John W. Frey and H. Chandler Ide’s *A History of the Petroleum Administration for War, 1941-1945*, produced by the federal government shortly after the war. (See P-16).

Exec. Order No. 9024, 7 FR § 329-02 (1942).

Dr. Brigham testified that the “allocation of steel, aluminum, and copper was of primary importance” to the War Production Board. These metals were essential to refinery processes and operations; companies like Humble or Standard Oil needed access to these materials to operate at all. The War Production Board developed the Controlled Materials Plan to allocate these materials to the military and other agencies for redistribution to their contractors. (D-1470 at 13). The War Production Board issued priority orders, preference ratings, and quotas governing access to these essential materials. (P-740 at 19).

In 1942, President Roosevelt created the Petroleum Administration for War, with Ickes as the Petroleum Administrator. (P-740 at 23). The office of Petroleum Coordinator was abolished. (*Id.*). By the end of 1942, the War Production Board had delegated responsibility for petroleum products to the Petroleum Administration for War. A December 11, 1942, telegram from Donald Nelson, Chairman of the War Production Board, to Petroleum Administrator Ickes described this delegation of responsibility and included a schedule of 47 petroleum products over which the Board had jurisdiction. (P-16 at MIS-00022775–77).

The Petroleum Administration for War was authorized to issue “petroleum directives” or “petroleum administrative orders” to the industry. These directives and orders governed the “production, refining, treating, storage, shipment, receipt and distribution within the industry of petroleum, petroleum products, or associated hydrocarbons.” (P-740 at 23). The Administration directed the refineries to: produce “specific products required by the armed forces and other war procurement agencies”; “perform all supply functions with respect to aviation fuels and lubricants, taking necessary steps to assure that available supplies are procured for and supplied to authorized recipients”; and meet the “petroleum raw material requirements of the synthetic rubber program

... to best advantage in relation to optimum yields of all petroleum war products, through the provision of necessary capacity and the direction of its operation.” (P-740 at 24).

The Chairman of the War Production Board delegated to the Office of Petroleum Coordinator, which became the Petroleum Administration for War, the contracting authority to determine the price and technical details of avgas production and procurement, and delegated to the Defense Supplies Corporation all other contracting authority. (P-16 at MIS-00022775-77). In the 1942 “Four Party Purchase Agreement,” the Defense Supplies Corporation, the U.S. Army, U.S. Navy, and the Petroleum Administration for War agreed that the Defense Supplies Corporation would act as the sole purchaser of avgas from the nation’s petroleum industry and would resell it to the United States armed forces as needed. (P-16 at MIS-00022752).

By controlling the nation’s crude oil supply, the federal government controlled the nation’s petroleum industry. The Defense Supplies Corporation was the federal agency that contracted with the refinery owners to purchase the avgas produced during World War II, as well as the slate of other products put to wartime use. The Defense Supplies Corporation entered into avgas supply contracts with Humble and Standard Oil of New Jersey, agreeing to purchase the refineries’ entire production of avgas for a stated number of years. (P-740 at 37).

Exxon argued in the bench trial that its predecessors were effectively “compelled” to enter into these avgas supply contracts and had limited, if any, authority to negotiate terms. The government responded that private industry voluntarily cooperated with the federal government in order to simultaneously profit from, and support, the defense effort. While patriotism played a role, and while the refineries profited, the court finds that Exxon has shown from the historical record that the government effectively left the companies no choice in contracting to make and supply avgas, and little room to maneuver on contract terms.

The record evidence shows that to continue operating during the 1940s, owners of refineries capable of making avgas had to contract with the federal government to supply avgas and other war materials. Source documents demonstrate that the federal government clearly and frankly took this position. George Parkhurst, the Petroleum Administration for War Director of Refining, wrote in November 1943 to George Hill, the Defense Supplies Corporation Executive Vice President and General Counsel: “P.A.W. insists that each company utilizes all of its facilities to make 100 octane aviation gasoline to the extent of its ability to so do, and there is not in fact any freedom to make a choice between contracting and not contracting.” (P-331 at MISC-00063853).

J. Howard Marshall, the former Chief Counsel for the Petroleum Administration for War, testified that companies that “weren’t making essential war materials” were simply not able to run their refineries. According to Marshall, the Petroleum Administration for War “quit allocating crude oil to those that didn’t devote themselves to what we called the war effort.” (P-785 at 9). Similarly, Louis R. Goldsmith, Chief of the Technological Section, of the Administration’s Refining Division, testified that if refineries refused to comply with a Petroleum Administration for War directive, “they would be probably denied an allocation of crude oil. And they’d be pretty much cut off at the pockets, they wouldn’t have a business to operate.” (P-647 at MISC-00063819).

Both Humble and Standard Oil fell in line, serving their country and bowing to reality at the same time. They signed contracts with the Defense Supplies Corporation to prioritize avgas production at both the Baytown and Baton Rouge refineries, two of the nation’s largest. (See P-52; P-53; P-54).

Directives from the Petroleum Administration for War also specified how refineries must allocate their product mixes. The Administration implemented a Planned Blending Program, issuing a blending schedule each month to refiners with “specific instructions as to the composition of his blends, the sources from which he was to obtain components, and to whom he was to ship other components – all to the end that the utmost possible 100-octane could be forced each month from the available facilities.” (P-740 at 26).

A government report entitled “The Role of Defense Supplies Corporation in the Wartime Aviation Gasoline Program” helpfully described the broad extent and nature of the Petroleum Administration for War powers and actions during World War II. The Administration “coordinated and supervised” the activities of private companies’ refineries as “units of one enterprise and directed their operations so as to produce the maximum quantities of aviation gasoline at the earliest possible time.” (P-29 at MIS-00022860).

Throughout the war, the Petroleum Administration for War issued directives to all refineries to run their production operations on a continuous basis and to minimize downtime for maintenance and repair. Bruce Brown, Assistant Deputy Petroleum Administrator, issued a June 21, 1944, order requiring that:

- (1) Those facilities contributing in any way to 100 octane gasoline production should be kept on stream maximum possible time.
- (2) Postpone shutdowns for routine inspection and maintenance as long as possible and minimize down time by every means at your disposal[.]

(P-646 at MIS-0003236). To ensure maximum production, the Petroleum Administration for War had to approve refineries’ proposed deviations from these schedules. Mr. Gravel described a request by Humble Oil to the Administration in September 1943, to allow Humble to decrease its production of an avgas blending agent in order to meet the Administration’s request for increased

motor gasoline for military use. An internal Administration memorandum not only rejected the request to decrease production, it directed Humble to increase production of the avgas components by 50 barrels per day. (P-652). Mr. Gravel testified that the Administration staff calculated the “net effect” of this directive on Humble’s slate of products, recognizing that it would put the refinery out of balance, but that balance was secondary to the goal of maximizing avgas production. (Docket Entry No. 272 at 191–93).

The Petroleum Administration for War established a formal approval process for new construction at refineries. The War Production Board regulated the use of “controlled materials,” including steel and copper, vastly limiting the ability of refineries to engage in construction or repairs without government approval. (Docket Entry No. 261-5 at ¶ 269). Even federally owned structures were subject to these directives and constraints. A memorandum dated June 2, 1942, from W. Drager at the Defense Plant Corporation, explained that all construction related to the government-owned plantors adjacent to the refineries “shall be of the cheapest, temporary character with structural stability only sufficient to meet the needs of the service which the structure is intended to fulfill during the period of its contemplated war use.” (P-358 at MISC-00064643).

The Petroleum Administration for War denied requests from national refineries, including Baytown and Baton Rouge, for improved waste-handling systems, on the ground that the improvements would distract from, or interfere with, operations “vital to the war program.” As explained by a Baytown official, “[d]uring the war it was not possible to devote much technical manpower to the problem of effluent improvement since it was obvious that saving surface waters was secondary to saving men.” (P-103 at A000824). For example, the federal government denied a request from Baytown to use concrete to pave portions of its site. The result was that more

sediments would leave the land and enter the combined sewers, comingling with oil and increasing the waste streams produced. (Docket Entry No. 281 at 258–61).

Dr. Brigham also testified about a number of other strategies the federal government used to encourage private production of the maximum amount of materials necessary for the war effort. (See D-1470 at 15). These strategies included: Emergency Plant Facilities contracts for the financing of plant or equipment construction, (*id.* at 18); necessity certificates, which allowed a company to accelerate depreciation on its facilities, (*id.* at 16); Defense Plant Corporation contracts for purchasing and leasing equipment, (*id.* at 18); and the Aviation Gasoline Reimbursement program, in which the federal government “allowed oil companies that entered into long-term avgas supply contracts to recoup costs they could not have anticipated at the time of the execution of the contract,” *see United States v. Shell Oil Co.*, 294 F.3d 1045, 1050 (9th Cir. 2002).

The impact of these programs was substantial. By the mid-1940s, refineries were producing approximately half a million barrels of 100-octane gasoline a day. (D-1470 at 26; P-740 at 26). The nation’s avgas production was viewed as essential to military victory over the Japanese and Axis forces. Geoffrey Lloyd, the British Minister of Fuel and Power, stated that “without 100-octane we should not have won the Battle of Britain. But we had 100-octane.” (P-18 at A000253). Ralph Davies, the Deputy Petroleum Administrator for the Petroleum Administration for War, stated in a hearing before a U.S. Senate Special Committee after World War II that “100-octane is to motor gasoline what the Lincoln is to the Ford. If birds ran on gasoline it would give a hawk the performance of an eagle. . . . On all counts, 100-octane was the lifeblood of the United Nations in the air.” (P-17 at A000235).

The refineries were also critical to the production of other chemicals and feedstocks necessary to the war effort and often produced in connection with avgas. For example, Baytown

and Baton Rouge collectively produced straight-run naphtha, butylenes, and styrene. (P-793 at 7). These components were used in the production of important war products beyond avgas, including toluene and synthetic rubber.

Toluene, an aromatic hydrocarbon used as a high-octane component of avgas and as a component of trinitrotoluene, or TNT, was produced at both Baytown and Baton Rouge during the war. The government's Ordnance Department first approached Standard Oil about producing nitration-grade toluene for TNT in 1939. Events leading up to America's entry into World War II made it clear that nitration-grade toluene demand would far exceed the quantity that could be made available from the 1938 production methods. (P-149 at A001138). To meet this growing need, the Ordnance Department designed and constructed the Baytown Ordnance Works on land adjacent to the Baytown refinery in 1941. (P-139 at A001016; P-140). Proximity to the refinery was critical because toluene production required crude-sourced naphtha. (P-115 at BAYHIS-00028178–79). During the war, the Baytown Ordnance Works produced over 40 percent of the nation's nitration-grade toluene. (*See id.*; P-150; P-149).

Synthetic rubber was also critical to the defense effort. After Pearl Harbor, the United States lost access to Southeast Asia's natural rubber sources. President Roosevelt designated synthetic rubber as a strategic and critical war material on June 28, 1940. (P-740 at 34). The federal government created the Rubber Reserve Company as a subsidiary of the Defense Supplies Corporation to provide synthetic rubber for military and civilian requirements. The Rubber Reserve Company had the authority to oversee the operation of synthetic-rubber plants owned by the Defense Supplies Corporation to produce synthetic rubber for national defense purposes. (P-315 at A002975–A002977). Unlike the Baytown and Baton Rouge refineries, which were owned

by Humble and Standard Oil respectively, these chemical plants, or “plancors,” were owned by the federal government. *See Exxon I*, 108 F. Supp. 3d at 496.

The Petroleum Administration for War oversaw and controlled access to the petroleum supplies needed for the synthetic rubber program. (D-1470 at 26). Standard Oil of New Jersey had been researching methods of synthetic rubber production since the early 1930s. (*Id.*). Federal plancors for synthetic rubber production were located at both the Baytown and Baton Rouge refineries, with three at Baytown and two at Baton Rouge. (Docket Entry No. 272 at 234–35). As with the toluene plancor at Baytown, these plancors were located so that they could use materials from the refineries, such as butylenes, as well as the refineries’ waste-disposal systems. (*Id.* at 233–36).

To summarize, a federal network of agencies was created or adapted to coordinate the manufacture of war materials and their distribution to meet America’s military needs around the world. These agencies exerted significant control over the operations of refinery owners or operators that contracted to manufacture avgas, synthetic rubber, and other war materials. The government controlled access to the raw materials needed to run a petroleum refinery. The government used its authority to control access to the raw materials to help ensure that companies like Humble and Standard Oil entered into contracts to produce avgas, rubber, and other products. The government also used that authority to control many aspects of the refining process and operations. The government required refineries like Baytown and Baton Rouge to prioritize these war materials by producing as much and as fast as possible, deferring or neglecting maintenance and repairs that would require shutdown and startup delays, and deferring environmental protection structures and improved waste-handling processes. (*See, e.g.*, Docket Entry No. 281 at 258–61). The government’s control over, and the refineries’ restricted access to, materials and

skilled labor contributed to the reduction in maintenance and repair work. The result was an increase in hazardous substances produced in the refining process. And, as explained further below, because the war effort caused much of the delay in the steps taken to reduce and control the hazardous substances generated during the war, and because the production levels and commensurate need for pollution control was much lower before the war, the government should contribute more to the added remediation costs that the delay has caused.

The fact that the refineries continued during the war years to produce a range or slate of products with commercial value does not reduce the amount allocated to the government. As explained in greater detail below, the evidence showed that during the war years, the range or slate of products were also war materials, and most, if not all, were sold to the government for military needs. Besides avgas and rubber, the military needed products that could also be used for commercial purposes, such as gasoline to run the armed forces' trucks and cars.

In short, the government clearly bears the greater share of responsibility for the remediation costs attributed to the hazardous substances generated during the war years at issue in this suit.

c) The Petroleum Industry Post-World War II and During the Korean War

Dr. Brigham testified that during the early years of World War II, the petroleum industry worried that the expansion to meet wartime needs would result in excess capacity after the war ended. (Docket Entry No. 295 at 92–93). Those worries proved unnecessary. After World War II, the petroleum industry saw continued demand for its products, reflecting a robust United States economy and a booming consumer demand for, and ability to spend the money on, new products, especially automobiles. For example, Standard Oil of New Jersey reported a net increase in consolidated total revenue between 1950 and 1956. (D-3026 at 60). While the national production

of 100-octane gasoline dramatically dropped immediately after World War II, production of avgas increased from that point on. (P-785 at 6).

The period of extensive federal government control over the petroleum industry ended on VJ Day, but government involvement continued. The government-owned planters at both Baytown and Baton Rouge continued operating for several years after World War II ended, until the government sold or dismantled them. (*See* P-740 at 171-72; D-1470 at 52).⁸ The federal government maintained an interest in ensuring the ready availability of petroleum products needed in the event of another war. The Military Petroleum Advisory Committee was created in 1947 to consider problems relating to the nation's petroleum supply if a military need arose. (P-740 at 28). It did, in June 1950, when North Korea invaded South Korea.

The Korean War saw a heightened need for war materials from 1950 until the armistice was signed in July 1953. The federal response mirrored the government's efforts in World War II. Congress passed the Defense Production Act of 1950, granting the president authority to force industry to prioritize producing materials needed for national security. In 1950, the president created the Petroleum Administration for Defense, the successor to the Petroleum Administration for War. (P-740 at 28–29). The federal government's response included economic incentives to spur the production of war materials, including aviation gasoline and synthetic rubber. (*See* P-740 at 28; D-1470 at 27).

Dr. Brigham testified that the Defense Production Act was a response to material shortages resulting from “a lack of production aviation gasoline to meet commercial demand and military needs, both domestically and abroad.” (D-1470 at 28). The Petroleum Administration for Defense ordered refineries to increase their production of wartime materials, including six directives and

⁸ Section II.A.4 discusses the details of the federal government's sale of the planters.

orders related to the production and use of petroleum products, and four directed to aviation gasoline. (*Id.* at 28). Mr. Brigham identified two of the orders as issued in response to labor unrest and concerns about production stoppages during the Korean War. (*Id.* at 29). While avgas production did not reach World War II levels, the industry experienced continued growth through the Korean War. (P-785 at 6). ExxonMobil did not contest this testimony. The record evidence as to the war-material production levels and the hazardous-substances emission levels at Baytown and Baton Rouge during the Korean War years was less detailed and specific than the evidence as to these issues during World War II.

3. Government Regulation of Hazardous Waste Emissions in Refineries

Both historians agreed that before World War II, there was little government regulation of refinery waste. The absence of those requirements, combined with much less production before than during the war, reduced the need and incentive to install structures or processes to control waste production before World War II.

During the war, as noted, waste management was delayed in order to prioritize war-material production. Both the Baytown and Baton Rouge refineries and some of the plancors were designed to pump waste directly into surrounding waterways. In 1944, the U.S. Army Corps of Engineers issued a memorandum describing the “serious problem” created by the Baton Rouge refinery’s disposal of “vast wastes” into the Mississippi River. (P-109 at A000842). The Corps continued to investigate the Baton Rouge refinery’s practices, with a visit again in 1946 to follow up on the progress toward reducing the river pollution. (*See* D-764).

After World War II, as production pressures eased and material and labor availability increased, refineries were able to, and did, invest in maintenance and waste-handling improvements. These improvements began in the 1950s and 1960s. Major regulatory changes

limiting refinery wastes enacted in the 1970s increased the need for environmental controls and remediation. Most important for the Baytown and Baton Rouge refineries was the passage of the Resource Conservation and Recovery Act of 1976, 42 U.S.C. § 6901 *et seq.* Under this Act, beginning in the late 1970s, the Environmental Protection Agency promulgated a series of technical regulations on managing, storing, treating, and disposing solid and hazardous wastes. The regulations required refineries, including Baytown and Baton Rouge, to minimize the release of hazardous wastes to soil or to groundwater or to surface waters. The Act authorized states to enact similar resource conservation legislation, and both Texas and Louisiana did so.

The Texas Solid Waste Disposal Act is a state statutory and regulatory analog to the Resource Conservation and Recovery Act, imposing the same or more stringent technical regulations on Texas industrial facilities, including the Baytown refinery. *See* TEX. HEALTH & SAFETY CODE §§ 361.001 *et seq.* Louisiana enacted the Louisiana Solid Waste Management and Resource Recovery Law, which applied to the Baton Rouge refinery. *See* LA REV STAT § 30:2151 *et seq.*

To comply with the new regulatory demands, both refineries worked with environmental consultants and their own staff to design and implement facility-wide hazardous waste-management initiatives. Both refineries also worked with state regulators, including the State of Texas Commission on Environmental Quality and the Louisiana Department of Environmental Quality, to design and implement ongoing response actions, including investigating and remediating contamination at the Baytown and Baton Rouge refineries. These investigations revealed the presence of significant amounts of contaminated wastes attributable to the World War II era. (*See, e.g.*, Docket Entry No. 274 (testimony of Leon Paredes); Docket Entry Nos. 280, 281 (testimony of Michael Pisani); Docket Entry Nos. 287, 305 (testimony of Peter Gagnon)).

Congress enacted the Comprehensive Environmental Response, Compensation, and Liability Act in 1980 “in response to the serious environmental and health risks posed by industrial pollution.” *Burlington N. & Santa Fe Ry. Co. v. United States*, 556 U.S. 599, 602 (2009); *see also United States v. Bestfoods*, 524 U.S. 51, 55 (1998). “The Act was designed to promote the timely cleanup of hazardous waste sites and to ensure that the costs of such cleanup efforts were borne by those responsible for the contamination.” *CTS Corp. v. Waldburger*, 573 U.S. 1, 4 (2014) (quoting *Burlington N.*, 556 U.S. at 602). As amended by the Superfund Amendments and Reauthorization Act of 1986 (“SARA”), Pub. L. No. 99-499, 100 Stat. 1613, CERCLA provides several alternative means for cleaning up contaminated property.

Exxon’s remediation and response actions have already required it to spend millions in investigation and remediation work. Exxon will incur similar future costs for the ongoing remediation at several sites at both the Baytown and Baton Rouge refineries. In Phase 1 of these consolidated lawsuits, the parties and the court addressed the CERCLA criteria governing Exxon’s claim that the government should pay all or part of these costs because of the control it exerted over the refineries during World War II and the Korean War. The court determined in Phase 1 that both Exxon and the government share responsibility for the costs, and determined in Phase 2 the method to allocate and calculate those costs. This final opinion determines, based on the extensive record resulting from the motions and the bench trial, which party pays what amounts, and explains why.

4. The Facilities

a) Baytown

The Baytown refinery is located 25 miles east of Houston, Texas. It is adjacent to the Houston Ship Channel, Black Duck Bay, Mitchell Bay, and Scott’s Bay, which flows into the Gulf

of Mexico. Humble Oil & Refinery Company, incorporated in 1917 and a successor to the Humble Oil Company, built the Baytown refinery from 1919 to 1920. (P-740 at 44). In 1919, Humble sold 50 percent of its stock to Standard Oil of New Jersey. (*Id.*). From 1919 to 1921, Humble constructed a lubricating oil plant at Baytown. (*Id.*). In the early 1920s, the refinery's processing capacity was 10,000 barrels a day. It grew to over 30,000 barrels a day by 1925. (P- 740 at 44; D-1470 at 31). Continued growth in Baytown's capacity for crude runs made it the largest refinery in the United States by the 1940s. (*Id.*).

Through the 1930s, Humble expanded the Baytown refinery by adding new refining plants. In 1938, a hot-acid catalytic polymerization, or "codimer," plant and the world's first commercial alkylation plant were added. (P-740 at 45–46). The alkylation plant would be particularly useful in making components for 100-octane aviation gasoline. By 1939, Baytown was the world's largest manufacturer of avgas. (*Id.*).

In 1939, the Ordnance Department approached Standard Oil about producing nitration-grade toluene for TNT. The war in Europe and the Pacific and the possibility of American involvement led to the realization that "the nitration grade toluene requirement would far exceed the quantity that could be made available from coke production" as of 1938. (P-149 at A001138). That in turn led to the design and construction of the government-owned Baytown Ordnance Works to produce nitration-grade toluene. (*Id.*).

In February 1941, the War Department acquired a parcel of land from Humble that was adjacent to the Baytown refinery, to build and operate the Baytown Ordnance Works. (P-139 at A001016; P-140). Humble constructed the Works at the government's direction and according to its specifications. (*See* P-139 at A001017; P-149 at A001144). The Works contained toluene-

producing process facilities, above-ground tanks, military barracks, a mess hall, air-raid shelters, perimeter fencing, and four guard watchtowers. (*See* P-141; P-142).

From 1941 to January 1946, the War Department owned the Baytown Ordnance Works. (P-139 at A001016; P-144; P-145; P-147). From September 1941 to August 1945, the U.S. Army leased the Works to Humble. (P-139 at A001016; P-148). The wastes generated by the operations of the Baytown Ordnance Works included spent-acid sludge, spent-alumina catalyst, and oily acidic wastewater effluent. (P-149 at A001150; P-151 at A001155; P-139 at A001024). The wastewaters generated by the Works were conveyed by a 36-inch concrete sewer line to the refinery sewer system. The sewer emptied into an earthen ditch known as the West Drainage Ditch, which transported the wastewaters to the refinery's separators system for treatment. (P-227 at A002030). The Baytown Ordnance Works is one of the placors at issue in this suit.

Between 1942 and 1943, other placors were built alongside the Baytown refinery, including Butadiene Plancor 485; Butyl Rubber Plancor 1082; Copolymer (Styrene) Plancor 877; and Hydrocodimer Plancor 1909. (P-740 at 48–49). As with the Baytown Ordnance Works, these placors were located to take advantage of the Baytown refinery's raw materials and infrastructure.

In 1955, Humble purchased most of the Baytown Ordnance Works, as well as Plancor 485, 1082, and 1909, from the government. (*See id.*). The government sold Plancor 877 to the United Carbon Company in 1955. (*Id.* at 49).

b) Baton Rouge

The Baton Rouge refinery, located on the east bank of the Mississippi River and south of the Monte Sano Bayou, was built in 1909 by Standard Oil of Louisiana. (*Id.* at 138). Standard Oil of Louisiana was an affiliate of Standard Oil of New Jersey, and, in 1945, was consolidated with Standard Oil Company of New Jersey. (*Id.*). The Baton Rouge refinery began operations

processing kerosene, gasoline and fuel oil, but moved to primarily gasoline production before World War II. (*Id.* at 141). Expansions in the 1930s increased the refinery’s capacity to produce avgas, avgas blending agents, and 100-octane avgas. (*Id.* at 142).

As with Baytown, a number of federal plancors were built at Baton Rouge during World War II. Beginning in 1941, the federal government purchased land to build and operate Butadiene Plancor 152; Butyl Rubber Plancor 572; Catalyst Plancor 1526; Butadiene Conversion Plancor 1355; Avgas Blending Components Plancor 1065; and Hydrogenation Plancor 1868. (*Id.* at 144–45). In 1955, Standard Oil purchased Plancor 572, Plancor 1355, and Plancor 1868. (*Id.*). In 1950, Plancor 1526 and Plancor 1065 were dismantled. (*Id.*). In 1955, the government sold Plancor 152 to the Copolymer Rubber & Chemical Corporation. (*Id.*).

B. The Allocation Model

1. Background

In 2017, in the second phase of this three-phase case, the parties cross-moved for summary judgment on what allocation method the court would apply. *See Exxon II*, 335 F. Supp. 3d at 941. In Phase 2, Exxon argued for a “production-based” approach that would use the crude-processing rate of the refineries as a way to measuring the amount of hazardous waste generated. *Id.* at 937–38. The government proposed a “time-on-the-risk” approach, which operates on the assumption that each facility—the refinery and associated plancors at Baytown and Baton Rouge—generated the same amount of waste each year. *Id.* at 942.

The court’s 2018 summary judgment opinion outlined three general steps it would follow in allocating remediation costs between Exxon and the government. They are:

- (1) assigning shares of waste to the various years of plant operation;
- (2) determining the portion of costs that are associated with the periods of the government’s involvement and are attributable to war products for which the United States is responsible; and

(3) equitably dividing the portion of wartime-related costs that it determines to be subject to allocation, based on the parties' respective degree of involvement with the wartime activities and several other equitable factors.

Exxon II, 335 F. Supp. 3d at 941. The court adopted the "production-based" allocation method for the first step, finding that it better reflected the amount of waste generated each year and was supported by CERCLA case law. *Id.* at 942. The government continued to assert its reasons for preferring the "time-on-the-risk" allocation method, but it applied the production-based method in this third stage of the litigation.

The court will follow the allocation methodology described in the 2018 summary judgment opinion for this trial. The allocation model was designed by Richard White, Exxon's allocation expert. The government's allocation expert, Matthew Low, adopted Mr. White's model, though he criticized some aspects and made some changes. Mr. Low's criticisms and proposed changes are addressed below. The court finds and concludes that while some adjustments based on those criticisms are appropriate, the reasons for adopting the production-based allocation method and rejecting the government's preferred time-on-the-risk method remain. Both methods are ways to approximate, in hindsight, what happened years ago, often using scanty records and no percipient witnesses. Both methods are necessarily imprecise as a result, but the production-based method is more accurate, and more precise, than the government's. The court again rejects the government's proposal to use the time-on-the-risk model.

2. Step One: Assigning Shares of Waste to the Various Years of Plant Operation

a) Cost Allocation

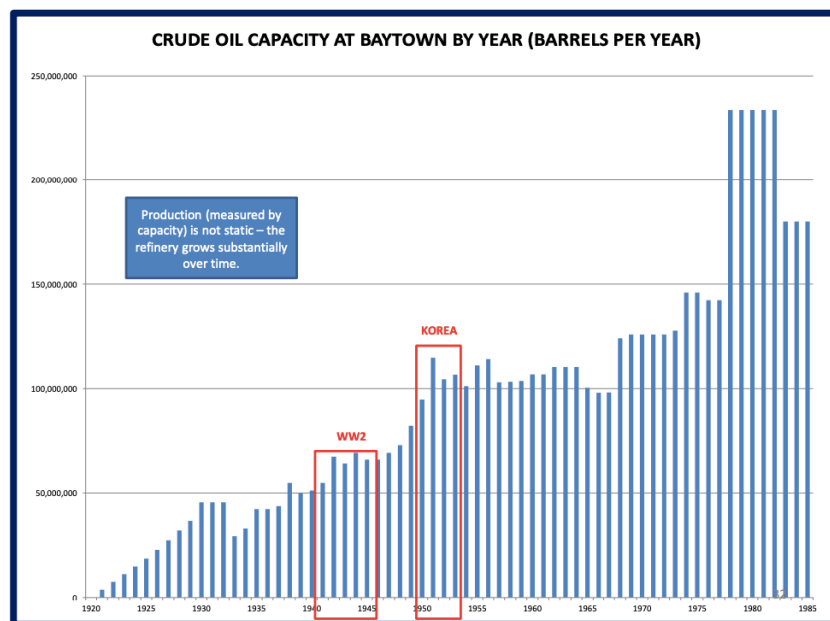
The first step of the production-based allocation method is to assign Exxon's past response costs to specific years of operation at the facilities. The production-based method looks at the capacity for crude-oil processing at each facility. Facility-specific process-improvement steps are

also examined to determine the amounts of wastes that result. The parties agree that because refineries normally operate close to their capacity, crude capacity is a reasonable surrogate for actual crude runs. (Docket Entry No. 339 at 420, 713; Docket Entry No. 340-1 at 161).

Mr. White determined the refineries' production capacity by crude throughputs. The parties agree that in the absence of data on actual waste output, the total amount of waste generated by oil refineries such as Baytown and Baton Rouge is roughly proportional to the size of the crude run at each refinery. (Docket Entry No. 339 at ¶ 420; Docket Entry No. 340-1 at ¶ 163). At its simplest, the larger the amount of crude processed in a year, the higher the waste production and the higher the response costs for that year.

Based on the available data, Exxon determined the response costs for each year between 1925 and 1985 for Baytown and 1910 and 1985 for Baton Rouge. (Docket Entry No. 293 at 26; P-763 at BAYTOWN-008–10). Figure 1 demonstrates the crude-oil capacity at Baytown, showing that with a few exceptions, capacity was continuously growing.

FIGURE 1



(P-761 at 14).

b) Waste-Improvement Factors

During World War II, the Baytown and Baton Rouge refineries were required to, and did, run at their maximum production capacity to meet the government's need for essential war materials. The refineries processed significantly more crude oil, which created significantly more waste.⁹ Gregory Kipp, one of Exxon's engineering experts, testified that wartime production increased to meet the government's demands. Mr. Kipp testified that the refineries ran their equipment at higher temperatures and higher pressures in order to make more avgas and avgas components. Certain byproducts that result from lower temperatures were not produced, while more heavy hydrocarbon wastes were produced as sludges that would leak out of the equipment and into wastewater. The contaminants included emulsions, a combination of water and hydrocarbon solids that were both difficult to separate and more toxic than previous waste streams. (*See, e.g.*, Docket Entry No. 281 at 167–68).

Mr. Kipp explained that the fluids used in reactors running at hotter temperatures and higher pressures had a harsh impact on the secondary equipment in the production line, leading to more leaks and deterioration. (Docket Entry No. 283 at 74). The refineries also used “repurposed” older equipment for avgas production, and then delayed or neglected maintenance to meet the

⁹ The government disagrees with this finding, but its criticism is not well founded. Dr. Oyekan, the government's witness, explained that many of the refinery conditions Exxon's witnesses described would not have resulted in increased waste production during the war years. For example, Dr. Oyekan testified that scouring, also referred to as erosion, of equipment would not have created issues because the refineries were relatively new facilities during World War II. (Docket Entry No. 319 at 65–66). But Dr. Oyekan admitted that scouring could occur at Baton Rouge. (Docket Entry No. 315 at 217–19) (Q: . . . [D]on't you agree with me, sir, that, in fact, you would expect scouring and corrosion as a result of the presence of all that sediment running every day through the Baton Rouge refinery? A: Yes, maybe in some equipment where you are running water around, yes. You might have some over time. Yes, you could.”). Dr. Oyekan also conceded that the historical record described the refinery equipment at Baytown as old. (*Id.* at 182; *see also* P-115 at A00028174 (a 1943 report by Baytown for the War Agencies' Joint Inspection Trip explained that “[m]uch of the refinery equipment is old. The high rates of producing the many products from such equipment requires much more initiative, ingenuity, patience, and skill than would be required for the production from new and modern equipment”)). The court does not find Dr. Oyekan's testimony credible on the refineries' conditions during World War II.

government's production demands. As a result, corrosion, leaks, and equipment breaks were more frequent and widespread, increasing the release of contaminants. (*Id.*). Mr. Kipp described these circumstances as creating "ideal conditions that would not only create leaks during wartime itself, but leave a legacy of leaky, fouled, corroded, abraded and otherwise compromised equipment that produced leaks after the war." (P-755 at 37). The court found Mr. Kipp's testimony to be highly credible and reliable. He applied his extensive knowledge of the chemical processes and refinery conditions responsible for waste production, to evidence in the historical record, including the primary and contemporaneous sources.

Mr. Kipp explained that before the war, the common disposal strategies were burning, landfilling or landfarming, and water disposal.¹⁰ These options were often not feasible during the war. For example, the sludges and emulsions were not suitable for burning because of their high-water content. This was especially true at Baton Rouge, where the river water had a high silt content that would damage equipment if burned. (Docket Entry No. 281 at 237–38). This left land disposal as the primary disposal option during the World War II years.

After the war, the greater availability of materials and skilled labor to install and improve waste-handling systems, the growth of regulations requiring these systems, and other incentives, all combined to lead the refineries to install improved waste-processing systems. Multiple Exxon experts testified to the improved waste-processing systems that were implemented after World War II at both the Baytown and Baton Rouge facilities.

The record clearly shows that the facilities improved their efficiency and waste-handling procedures over time, justifying Mr. White's use of waste-allocation modifiers to reduce the

¹⁰ Landfarming is a technique used in refining operations for the disposal of waste. Contaminated materials are taken to a site where they are spread out and allowed to become incorporated with the top layers of soil. (*See* Docket Entry No. 270 at 28–29).

amount of waste generated per barrel of crude in different years. Crude runs increased greatly during the war years, but also continued to grow after the wars ended. Simply applying the allocation method would assign an increasing amount of costs year after year, which would not account for the reduction in hazardous-substance emissions over time. While crude capacity continued to grow at each facility, operations became cleaner over the years, generating less waste per barrel of crude. Examples demonstrating the impact of these developments and illustrating how they are measured in Mr. White's formula are discussed below for each of the two facilities.

The record evidence shows that both refineries designed and implemented a number of waste-processing improvements after World War II, a conclusion that multiple witnesses supported. Mr. White's model assumes that the available data is not only accurate, but represents consistent progress—that is, the refineries did not meaningfully deviate or backslide from the improvements they made. Mr. Kipp testified that Mr. White's numbers were “conservative” and likely overestimated the amount of waste generated at the refineries after the period of federal involvement ended. (Docket Entry No. 283 at 58–59).

While criticizing the weight and value Mr. White's model assigned to the relevant factors, the government does not offer a specific credible explanation or basis for the alternatives it proposes. Mr. Low, the government's witness, testified that he found no “significant data” reliable enough to use in an allocation model. (Docket Entry No. 326 at 239). He nonetheless offered a 50 percent adjustment multiplier to account for waste-handling improvements at the refineries. (*Id.* at 165). The court finds this approach and explanation less credible than Mr. White's, who cited specific data in the historical record supporting his numbers and whose conclusions are confirmed by other experts.

Based on the available evidence used to reconstruct past conditions and events, and the testimony of Mr. Gravel, Mr. Kipp, and Mr. White, the court finds the waste-multiplier factors that Mr. White adopted and used to be credible, reliable, and appropriate. They serve as a proxy for, and measure of, the results of programs that the refineries implemented after World War II to improve waste-handling processes and products.¹¹

(1) Baytown

The record evidence shows a number of post-war waste-handling system improvements at Baytown. These improvements included: adding cathodic protection to tanks and piping to eliminate tank and piping corrosion; installing a system to improve wastewater treatment by segregating the refinery's sanitary wastewaters from the industrial wastewaters; constructing a spent-caustics waste-collection system to prevent disposal of the spent caustics in the refinery waste system; improving separator technology through skimming devices and preseparators; installing an effluent filtration unit; installing permanent cooling water towers to eliminate the need for once-through cooling water; expanding sewer lines; and installing a sour-water stripper. (See Docket Entry No. 339 at ¶¶ 442–456).

These improvements reduced Baytown's waste production. In 1948, Humble created the "Refinery Loss Committee," charged with identifying, evaluating, and implementing specific process-control and waste-handling improvements to reduce oil losses and improve wastewater effluent quality. (P-261 at A002416–17). Humble's view was that waste and contamination should be "attack[ed] at the source," and that "[w]here feasible, modifications or additions have

¹¹ The allocation model proposed by Mr. White implements the role of waste-improvements at Step One. In its Phase 2 opinion, the court identified postwar waste-handling improvements as an equitable factor to be considered as part of the equitable allocation. *Exxon II*, 335 F. Supp. 3d at 947–48. The court also addresses this factor at Step Three.

been made to equipment and processes to eliminate the production or release of contaminants.” (*Id.*).

In the latter half of the 1940s, Humble launched a leak detection and repair program at the Baytown facility that significantly reduced facility-wide leaks and greatly improved leak response and cleanup. The Refinery Loss Committee implemented the leak detection and repair program facility-wide, reflecting Humble’s acknowledgement that “[m]inor leaks and losses, occurring daily in thousands of places at every refinery, constitute a serious and constant problem.” (P-263 at 10875).

Under the program, Humble devoted time and labor to monitor, identify, and resolve leaks throughout the facility. Humble also installed new equipment and retrofitted existing tanks, piping, valves, and other equipment with improvements to reduce oil losses. For example, Humble installed mechanical seals on oil valves facility-wide. According to an article entitled “Stop That Leak!” in the refinery publication, *The Humble Way*, this “simple procedure of installing mechanical seals” saved roughly 60,000 barrels of light oil a year. (*Id.* at 10876).

The authors of “Stop That Leak!” made clear that the reasons for these investments in waste reduction included making the facility a safer and cleaner place to work, and saving Humble thousands of dollars. The authors explained that a reduction in lost oil “from an estimated 1869 barrels a day in the third quarter of 1948 to an estimated 781 barrels a day for the same period of 1951” led to “a saving of about \$3,326 a day.” (*Id.*).

Mr. White relied on three distinct improvements to create the waste-processing improvement factors that he applied in determining the remediation amounts to allocate to Exxon and to the government. First, he applied a 70 percent waste-improvement factor to reflect reductions in separator sludge measured at the Baytown facility in the post-World War II years.

(P-791 at 68-76; Docket Entry No. 293 at 30–36). This figure comes from a 1958 technical article in *The Oil & Gas Journal*, which was peer reviewed and confirmed in a 1990 API Journal technical report. (P-269 at A002483–A002485; P-270 at A002491). According to a Humble study, from 1947 to 1957, the Baytown refinery generated approximately 0.067 pounds of separator sludge per barrel of crude oil run. By 1957, the refinery generated only 0.017 pounds per barrel of crude oil run. This 70 percent reduction in the amount of separator sludge generated was consistent with Humble data. This data, reported in 1958, showed that in 1947, the Baytown refinery generated 10,000 pounds per day of separator sludge, but by 1957 generated only 4,000 pounds per day of separator sludge. This equated to a 70 percent reduction when also considering the increase in crude oil processing levels in 1957 as compared to 1947. (P-269 at A002476, A002483–A002485). According to Mr. Kipp, this 70 percent reduction in the amount of separator sludge generated between 1947 and 1957 “is an important indicator of the overall reductions in pollutant releases at the site because it coincides with simultaneous improvements in the wastewater system that collected sludge and slop more efficiently.” (P-755 at 9).

Second, Mr. White applied a 90 percent waste-improvement factor to reflect reductions in oil in the Baytown facility’s wastewater. (P-791 at 77 to 82; Docket Entry No. 293 at 37–40). In 1947, Humble conducted a comprehensive study of the refinery’s waste system at the outset of its ten-year “effluent improvement program.” This study determined that the existing waste-processing systems for managing wastewater effluents were badly overloaded, due to both the significant amounts of wastewater generated by refinery operations—approximately 30 million gallons per day—and the undesirable effects of specific types of wastes. (See P-260 at A002403; P-256 at A002350). One finding was that the separators’ efficacy in removing oil and sediment from wastewater effluent was reduced because “serious difficulties are encountered when

emulsions and large quantities of finely divided solids enter the separator with the waste water,” resulting in the discharge of effluent that was of “unsatisfactory quality.” (P-256 at A002353). Through the effluent-improvement program, Humble implemented a series of process-control and waste-processing improvements, with the stated goals of (a) eliminating or reducing the waste sources, (b) reducing oil losses, (c) reducing wastewater volume, (d) reducing and improving management of separator sludge and slop oils, and (e) reducing wastewater contaminants and improving treatment efficiency. (P-755 at 4).

According to an article in *The Oil & Gas Journal*, Humble reduced the amount of wastewater effluent generated by the Baytown facility from approximately 44 million gallons per day in 1948 to 17 million gallons per day by 1958, more than a 60 percent reduction. (P-261 at A002415). The process-control improvements included ending the use of the once-through cooling-water process, which was known to damage equipment and carry dirt into and waste out of the refinery. (*Id.*).

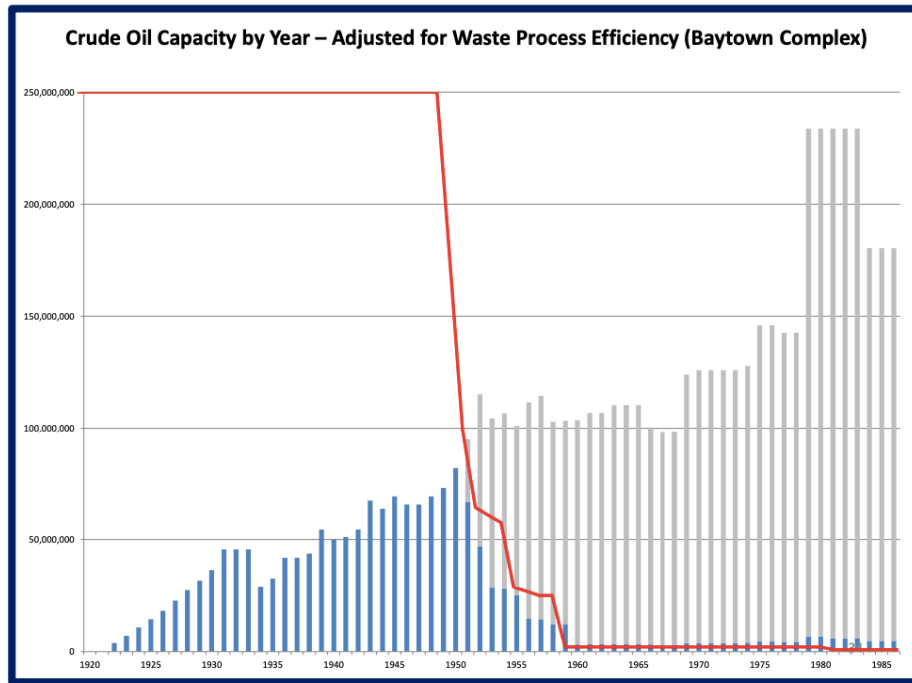
Between 1948 and 1952, the oil concentration levels in the Baytown refinery’s wastewater effluent were reduced by at least 90 percent. This was the midpoint of the effluent improvement program. (P-256 at A002362; P-785 at 128; Docket Entry No. 270 at 67–68). By 1958, the oil concentration levels in the Baytown refinery’s wastewater effluent had been reduced by at least 95 percent. (P-261 at A002415; P- 785 at 131; Docket Entry No. 270 at 73–74).

Third, Mr. White applied a 15 percent waste-improvement factor to represent improvements in refinery operations made to comply with regulatory changes, primarily the Resource Conservation and Recovery Act, starting in 1980. (*See* Docket Entry No. 293 at 40).

Applying these three waste-improvement factors leads to a roughly 90 percent reduction in allocated response costs for the years beginning in 1959. Figure 2 demonstrates the impact of

these waste-improvement factors on the measurement of the crude oil capacity at Baytown over time.

FIGURE 2



(P-761 at 26).

The government criticizes Mr. White's reliance on these waste-improvement factors. In response to the first factor, the reduction in separator sludge, the government argues that Exxon neither provided nor pointed to evidence that this reduction in separator sludge actually occurred or that the refinery maintained the improved levels as it increased production in the 1960s and later. The government focuses on a disclaimer in the 1990 API Journal article discussing the 1958 data, stating that the data may "not be representative of" the total amount of sludge produced. (*See* P-269 at A002484-2485). As part of his testimony for the government, Mr. Low presented a series of data points showing that separator sediment and sludge might have been greater than the 1958 data suggests. (*See* D-3031 at 56).

Similarly, the government argues that the second factor, the reduction of oil in the wastewater, is inflated because the oil recovered from the wastewater represents oil that would otherwise have evaporated before it made its way into landfills or waterways, and it would not have contributed to the contamination requiring remediation. (*See, e.g.*, Docket Entry No. 340-1 at 25–26). Mr. Low criticizes Mr. White’s reliance on a 1964 permit application that estimated a 90 percent oil recovery, noting that the permit application acknowledged that the recovered oil came from “the oil lost by evaporations on the master separator,” rather than from oil lost to the ground or waterways. (D-183 at 7).

Mr. Low found little credible data on waste improvements at Baytown supporting Exxon’s use of the waste-improvement factors in determining the remediation cost amounts each party should pay. (*See* Docket Entry No. 326 at 239). Mr. Low argued that a better measure of the benefits from Exxon’s waste-improvement processes would be the factor he applied in his “time-on-the-risk” model. This factor would result in a roughly 50 percent reduction in waste applied over several years to credit Exxon’s efforts in waste improvements, rather than the 90 percent reduction Mr. White calculated. (D- 22 at 28-30; Docket Entry No. 326 at 165). Adopting the government’s skepticism of Mr. White’s waste-reduction factors would result in a 10.84 percent reduction in the government’s allocation for the Baytown refinery remediation costs. (*See* D-3031 at 103).

The government also objects to the fact that Mr. White calculated the combined effect of the different waste-processing improvement factors, arguing that this created a “disproportionate composite waste reduction factor that serves to isolate periods when Exxon is responsible for production from almost all responsibility for wastes associated with that production.” (Docket Entry No. 340-1 at 200). Mr. White testified that calculating the combined effect was appropriate

because each factor had an independent impact on waste production. Mr. White showed that his calculations “match up with the measurements that the facility undertook.” (Docket Entry No. 306 at 245).

The court finds that Mr. White’s approach, with the support in the record from the refinery’s own contemporaneous measurements and studies, is more reliable and his testimony more credible and entitled to greater weight, than Mr. Low’s testimony on these issues. The court largely adopts Exxon’s approach for measuring the impact of waste-reduction improvements after World War II at the Baytown facility.

(2) Baton Rouge

The record evidence demonstrates that Standard Oil implemented numerous post-war waste-handling improvements at the Baton Rouge refinery as well. Shortly after World War II ended, Standard Oil embarked on a nearly decade-long effluent-improvement program coordinated by its new Oil Conservation Department. This program included comprehensively studying existing waste-processing systems and installing process-control and waste-handling improvements. (P- 282 at A002610). According to Mr. Gravel, the Baton Rouge Oil Conservation Department was “tasked with . . . reducing pollution in the post-war years and conserving oil.” (Docket Entry No. 270 at 76).

The improvements at the Baton Rouge refinery included: installing cathodic protection on tanks and piping to reduce corrosion-related oil leaks; installing a spent-caustics waste-collection system to prevent the disposal of these wastes in the separators and waste system; installation of a slop-oil collection system; rebuilding and expanding the separator system; and constructing and operating an emulsion-treating unit. Based on the record evidence of the improvements and the evidence of their impact over time, Mr. White first applied a 61 percent waste-improvement factor

to reflect reductions in separator slop measured at the Baton Rouge refinery after World War II. (P-791 at 152–56).

By 1949, Standard Oil had determined that, after the initial several years of its effluent-improvement program, it had already achieved a nearly 60 percent reduction in oil losses at the facility. (*See* P-274 at A002537; P-785 at 135; Docket Entry No. 270 at 77–78). The company determined that overall oil losses at the Baton Rouge facility had been reduced by 58 percent, based on data that the overall refinery crude storage and manufacturing loss had been reduced from 2.12 percent in 1947 to 1.24 percent in 1949. (P-274 at A002537).

By 1949, Standard Oil also determined that between 1946 and 1949, the process-control and waste-handling improvements had reduced separator-slop generation by 34 percent on a per-barrel basis. Standard Oil projected that separator-slop generation would be reduced by 61 percent on a per-barrel basis between 1946 and 1951. (*Id.* at A002534).

Based on the historical data on separator-slop reduction amounts, Mr. White applied a waste-improvement factor of 34 percent beginning in 1949, increasing this factor to 61 percent in 1951. According to Mr. Kipp, the separator-slop factor “is a very good indication of how [the] leak detection and repair program was performing system-wide because these wastewater treatment systems enervate the entire facility.” (Docket Entry No. 281 at 280–81).

Second, Mr. White applied a 98.1 percent waste-improvement factor to reflect reductions in oil content in effluent at the Baton Rouge refinery after World War II. (P-791 at 157–64). Between approximately 1959 and 1969, Standard Oil had reduced the oil-concentration levels in the wastewater effluent by 75 percent, and had reduced the amount of phenol in the wastewater effluent by 85 percent. (P-284 at A002675–76). Standard Oil determined that between 1969 and 1971, there was an additional 70 percent reduction in the oil-concentration levels and phenol-

concentration levels in the wastewater effluent, beyond the reductions achieved between 1959 and 1969. (*Id.*). Mr. Kipp testified that “[o]verall during the period of 1959 to 1971 period, Baton Rouge reduced oil concentrations in the wastewater effluent by approximately 94 percent, or to put it another way, in 1971 oil concentrations in the wastewater effluent were 6 percent of the oil concentrations in the wastewater effluent in 1959.” (P-755 at 26). According to Mr. Kipp, these post-war reductions in the oil contaminants in the wastewater effluent at the Baton Rouge refinery are a valid indicator of how effectively the refinery addressed its environmental performance. (P-755 at 20).

Third, as at Baytown, Mr. White applied a 15 percent waste-improvement factor, representing improvements in refinery operations to comply with increased regulatory requirements. Mr. White assigned a factor of 15 percent starting in 1980 to reflect these changes.

The government takes issue with Mr. White’s factors, arguing that the data he used to arrive at the amounts and apply them is unreliable. The government argues that the roughly 60 percent reduction in slop oil would not result in 60 percent less waste, because after recovery, slop oils are reprocessed and continue to contribute to the wastes that must be processed. Similarly, the government argues that the 98 percent reduction in oil content in wastewaters would not result in a cleaner refinery, because cleaner effluent simply results in more solid waste that must be removed from the separator system and either disposed of in a landfill or burned. (*See* Docket Entry No. 305 at 133). Mr. Low instead proposed an 8.83 percent reduction in the amount of remediation costs that Mr. White allocated to the government for the Baton Rouge remediation work. (*See* D-3031 at 102).

The court finds that Mr. White’s approach, with the support in the record from the refinery’s own contemporaneous measurements and studies, is more reliable and his testimony

more credible and entitled to greater weight, than Mr. Low's testimony on these issues. The court largely adopts Exxon's approach for measuring the impact of waste-reduction improvements after World War II at the Baton Rouge facility.

c) The Impact of Wartime Delays on Waste-Improvement Factors

Mr. White proposes a final adjustment to the cost allocation to account for the refineries' delays in building waste-improvement systems before and during World War II. The parties dispute how much of the delay is attributable to the federal government and how much to Exxon. The government criticizes Exxon's predecessors for not acting sooner to do more to limit and process wastes from the two refineries. Exxon persuasively responds that it had no acute need or incentive to do so before the war, and no practical ability to divert the resources or to access the materials and labor necessary to do so during the war.

Mr. Lerman, Mr. Kipp, and Mr. White testified that these delays increased the amount of waste and contamination as the rate and amount of refined products increased. (*See* Docket Entry No. 273 at 194–95; Docket Entry No. 283 at 67–69; Docket Entry No. 293 at 6–8). It is, of course, an exercise in hindsight reconstruction to determine how much less the waste and contamination would have been had the processing improvements been in place earlier. It is also an exercise in reconstruction to determine how much less waste and contamination would have persisted and required remediation had those improvements been in place earlier. This second exercise is complicated by the difficulty in separating the contamination resulting from the periods of federal involvement—World War II and, to a lesser extent, the Korean War—from the contamination from other periods. Despite these limits, the allocation-of-remediation-costs decision depends on the underlying determinations.

The government explained that some of the improvements that could not be built during the war period because of the government's refusals to make the necessary materials available or to issue the necessary approvals, such as the master separator at Baton Rouge, were considered by the refineries before the war but not adopted. But while the refineries could have implemented waste-processing improvements before World War II began, there was little incentive to do so because of the smaller scope and quantity of production before the war. As Mr. Lerman explained, "the need wasn't as urgent." (*See* Docket Entry No. 273 at 195–96).

The record evidence is clear that the government, not Exxon, bears the larger share of responsibility for the delays in waste-processing improvements during the war. The Petroleum Administration for War denied the refineries' requests to improve waste-handling systems during the war, emphasizing that the expenditure of labor and materials for pollution control was not directly related to the need to maximize and prioritize the manufacture of war materials, including high-octane avgas. As detailed below, this approach extended the period of the refineries' higher waste production and, correspondingly, the higher response costs to clean up the waste. In Exxon's view, because the government was responsible for the delays in implementation, the government should be allocated a portion of the costs for wastes produced after the period of federal involvement ended.

The record evidence shows that the Petroleum Administration for War denied at least two requests from Humble for specific pollution control improvements at the Baytown refinery. In 1944, Humble submitted two Form 30s, seeking Administration approval to build additional facilities to process the increase in acid sludge waste generated by the increased production of avgas and the related slate of products. Humble was concerned that its existing acid-reconcentration facilities were inadequate to manage the increased acid sludge waste resulting

from the accelerated rate and increased amounts of avgas and related materials. Humble asked the Administration for permission to build and operate new acid reconcentration facilities and new temporary acid burning facilities. Humble emphasized that the existing acid reconcentration facilities, which Humble planned to overhaul when circumstances permitted, would be inadequate to treat the acid wastes until the new acid reconcentration facilities were constructed. (Docket Entry No. 339 at ¶ 337).

The record is unclear as to whether the Petroleum Administration for War approved construction of the new acid reconcentration facilities. But the record is clear that the Administration denied Humble's request to construct and operate the temporary acid burning facilities. The Administration stated that if Humble delayed upgrading its existing acid reconcentration facilities, the refinery should not need the temporary acid burning facilities. (P-86; P-785 at 117). The result was a delay, imposed by the government, in installing these processing improvements.

The record evidence also shows that the Petroleum Administration for War denied two separate requests by Standard Oil for pollution control improvements at the Baton Rouge facility. In the early part of World War II, Standard Oil sought approval to install a large concrete master separator in part of Callaghan's Bayou. The master separator would separate and remove oil and oily silt from the process wastewaters before their discharge into Callaghan's Bayou, and ultimately, into the Mississippi River. (P-104 at A000829). Shortages of the raw materials and labor needed to make war products led the government to defer the separator until priorities, needs, and resources changed—after the war. Because federal wartime policy was fixed on prioritizing maximum avgas production in the two refineries, and in devoting available materials and labor to serve that overriding goal, federal approval for the master separator was refused. (*Id.*).

In mid-1944, Standard sought federal approval for the installation of a master separator at the Baton Rouge refinery, as well as for the installation of a silt-treating system. (P-105 at A000835; P-106 at A000836; P-107 at A000837). The request reflected the fact, as found by the U.S. Engineer Office, that “[t]he disposal of the vast wastes from the refinery is into the Mississippi River and presents a serious problem. The enormous operations and rapid expansion of the plant have overloaded the waste disposal system to the extent that pollution of the Mississippi is a daily occurrence.” (P-109 at A000842). The U.S. Engineer Office continued: “[w]ar activity has caused rapid expansion in plant facilities for production with no increase in waste disposal facilities. This has caused, as stated before, daily pollution of the Mississippi River.” (*Id.*). The U.S. Engineer Office recommended the construction of a master separator at Baton Rouge, as the “key unit” necessary to prevent further pollution of the Mississippi River. (*Id.*). The U.S. Engineer Office emphasized that:

[t]he project, including the separator, appears adequate to end pollution of the Mississippi River. It is believed that the urgency of construction is sufficiently necessary for the war effort that endorsement for approval by the P.A.W. and W.P.B. for the use of materials and labor for construction of the separator be given as requested.

(*Id.*).

Despite this endorsement, on August 22, 1944, the Petroleum Administration for War notified Standard Oil that it was denying the request to construct the master separator. The Administration stated that “this project is not of sufficient essentiality to the war program to warrant its installation at the present time and should be considered as a post-war project.” (P-110 at A000844; Docket Entry No. 270 at 55–56). The Administration did approve Standard Oil’s request to construct the silt-treating unit, because that unit would recover oil needed for the war effort. (P-110). In granting the approval, the Administration recognized that this unit was no

substitute for the master separator in pollution-reduction impact or effectiveness. (P-110; P-111). The Administration explained that the master separator would still need to be constructed, but not until after the war, stating that:

. . . it would be impracticable not only from the standpoint of economics but also from the standpoint of the construction of materials and manpower to install silt treating equipment only for the existing water separators when it is apparent that the applicant will have to expand its oil water separators after the war.

(P-111 at A000846).

The record evidence shows that the refineries acted quickly after the war to design and implement waste-processing improvements that were not built during the war years because of the government controls and restrictions. That did not avoid several years of post-war delay for some of the most involved and massive waste-processing structures.

Mr. White identified the years in which the decisions to delay constructing and installing specific waste-processing improvements were made. He constructed an alternative allocation scenario in which the same improvement, with the same amount of research and planning, had been implemented in the year it was requested. The result was a proportional reduction in the amount of waste to be allocated had the improvements been in place earlier. Mr. White calculated the impact of the delay by measuring the difference between the amounts that would have resulted and what did result, in each year. He determined that the reduction costs for the incremental differences should be allocated to the government, because it caused the delay in beginning the process.

The government objects to Mr. White's use of the delay factor, arguing that it punishes the government for something that was not entirely within its control. To remove the delay factor, Mr. Low proposed a 9.09 percent reduction of the government's allocation at Baytown and a 7.19 percent reduction of the government's allocation at Baton Rouge. (*See* D-3031 at 102, 103). The

government focuses on the master separator at Baton Rouge, presenting evidence that Standard Oil had considered installing a master separator as early as 1937, but did not take steps to do so until the war, when the government refused to approve it. (D-63 at 1).

The government's approach, as presented by Mr. Low, asks the court to engage in hindsight bias. In the 1930s, there was no acute need, no meaningful market incentive, and no significant regulatory requirement for waste-processing improvements, such as the master separator. In the 1930s, although avgas demand was beginning to emerge, it was scant compared to the overwhelming demand for avgas that would consume the world starting in 1941.

The government also points out that when Standard Oil sought the Petroleum Administration for War's approval to construct the Baton Rouge master separator in 1944, it did not propose an alternative design that it had considered earlier. This alternative design did not require concrete or steel to build. The government argues that the Administration would more likely have approved this design than the one presented. The government notes that the separator ultimately constructed after the war did not require either material. (*See* D-3031 at 70). But the overwhelming evidence shows that materials shortages during the war were not the only reason for denying or delaying waste-improvement projects. The Petroleum Administration for War also routinely denied projects that might reduce avgas production in any way. Diverting resources, and industry labor, to the separator construction when the refinery was required to operate around the clock to maximize avgas production was a separate and sufficient factor. There is insufficient, and insufficiently clear evidence, to allow the court to penalize Exxon based on hindsight speculation as to why Standard Oil did not seek approval for a particular separator design.

The court finds Mr. White's delay-factor analysis to be reliable and supported by the record evidence and expert testimony. The court adopts Exxon's proposed delay factors in the allocation methodology.

d) Applying the Step One Analysis to Specific Periods

Based on the historical evidence and the methodology outlined above, Mr. White divides the costs into different periods.¹² For Baytown, these periods are:

- Pre-War or Early Period (1910 until Mid-1941)
- World War II Period (Mid-1941 until late 1945)
- Post-World War II – Pre-Korea Period (late 1945 until Mid-1950)
- Korea Period (Mid-1950 until Mid-1953)
- Post-Korea Plancor Period (Mid-1953 until Mid-1955)
- The Delay-Only Period (Mid-1955 through 1958)
- Late Period (Mid-1955 through 1985)
- The Period of Federal Involvement (Mid-1941 through Mid-1955)

(Docket Entry No. 339 at ¶ 747). For Baton Rouge, these periods are:

- Pre-War or Early Period (1910 until Mid-1941)
- World War II Period (Mid-1941 until late 1945)
- Post-World War II – Pre-Korea Period (late 1945 until Mid-1950)
- Korea Period (Mid-1950 until Mid-1953)
- Post-Korea Plancor Period (Mid-1953 until Mid-1955)
- Late Period (Mid-1955 through 1985)
- The Period of Federal Involvement (Mid-1941 through Mid-1955)

(Docket Entry No. 339 at ¶ 787).

¹² In its Phase 2 opinion, the court explained that it would divide the response costs into four time periods:

- (1) 1928 to 1941, the pre-World War II period during which only Exxon was involved at the facilities;
- (2) 1942 to 1945, the World War II period, which included wartime production of avgas and other war products;
- (3) 1946 to 1955, during which Exxon and the United States were involved at both facilities; and
- (4) 1956 to the present, during which only Exxon was involved at the facilities.

Exxon II, 335 F. Supp. 3d at 942. The court finds that Mr. White has adopted these time periods and adjusted them as necessary to make clear which periods relate to the parties' involvement.

e) The Interim Results

Based on the methodology discussed above, the Step One allocation of costs to years are as follows.

Baytown (Refinery and Baytown Ordnance Works):

Periods	Assigned Cost	Share
Early Period	\$ 18,832,615	36.89%
WW2 Period	\$ 9,460,393	18.53%
Post WW2 – Pre-Korea Period	\$ 11, 876, 250	23.26%
Korea Period	\$ 4,312,227	8.45%
Post-Korea Plancor Period	\$ 1,520,104	2.98%
Delay Only Period	\$ 1,608,324	3.15%
Late Period	\$ 3,438,830	6.74%
TOTAL	\$ 51,048,743	100.00%

Baton Rouge:

Periods	Assigned Cost	Share
Early Period	\$ 10,631,616	40.82%
WW2 Period	\$ 2,684,061	10.31%
Post WW2 – Pre-Korea Period	\$ 3,945,484	15.15%
Korea Period	\$ 1,758,812	6.75%
Late Period	\$ 7,026,157	26.98%
TOTAL	\$ 26,046,130	100.00%

(See Docket Entry No. 339 at ¶¶ 749, 789).

3. Step Two: Determining the Portion of Costs that are Associated with the Periods of the Government's Involvement and are Attributable to War Products for which the Government is Responsible

The second step of the allocation model quantifies each party's relative involvement and responsibility, to assign the response costs. One dispute at this stage is how to allocate the costs associated with the production of other petroleum products that were made as part of the avgas production process during both World War II and the Korean War. A second dispute is whether Exxon has sufficiently proven a "nexus" between wastes in certain sites needing remediation and the period of federal involvement, as opposed to other causes from other periods. The government argues that because Exxon has not shown the necessary nexus between government action and the remediation costs, those costs should not be allocated to the government, but to Exxon.

Mr. Low resolves these disputes by proposing a 14.07 percent reduction in the government's allocation for the Baytown remediation costs and a 10.43 percent reduction in the government's allocation for the Baton Rouge remediation costs. Mr. Low offers several changes in his underlying calculations to reach his proposed reductions. For Baytown, Mr. Low proposes to reduce the allocation of avgas from 100 percent of crude throughputs to only 14 percent, with a government share of 100 percent; set other war products at 86 percent, with a government share of 40 percent; reduce the Korean War period avgas production from 100 percent to 1 percent, with a government share of 40 percent; and reduce the government's degree of involvement for the plancors during World War II from 100 percent to 60 percent. For Baton Rouge, Mr. Low proposes to reduce the allocation of avgas from 100 percent of crude throughputs to only 19 percent, with a government share of 100 percent; set other war products at 81 percent, with a government share of 40 percent; reduce the Korean Period avgas production from 100 percent to 1 percent, with a

government share of 40 percent; and reduce the government's degree of involvement for the plancors during World War II from 100 percent to 60 percent. (*See* D-3031 at 102–03).

The government did not present credible or reliable evidence supporting many of Mr. Low's proposed modifications to Mr. White's model. Some adjustments are appropriate, and they are reflected in the court's findings and conclusions and explained below.

a) War Products v. Commercial Products

The parties dispute how to characterize the refineries' output during the period of federal involvement. The parties agree that high-octane aviation gasoline was produced solely for military use and should be considered a "war product." But the parties dispute whether other products made during the period of federal involvement should also be considered "war products," or whether they are more accurately considered "commercial products."

Exxon's argument that all of its wartime production should be characterized as war materials has two parts. First, Exxon argues that due to the fundamentals of petroleum refining, the refineries could not make avgas without producing the slate of related products. Following Exxon's reasoning, these other products are necessarily war products because they were produced in order to fulfill the government's orders for avgas. Second, Exxon argues that while these other products had commercial uses as well, Exxon sold them to the military for such essential wartime uses as fuel for military cars and trucks and for weapons.

The government responds that because it did not operate the refineries, as the court held in the Phase 1 opinion, it should not be allocated remediation costs associated with hazardous wastes generated by producing products that were only incidental to producing avgas but not specifically ordered as a wartime priority. The government argues that Exxon could have sold, and did sell, these products, and presumably profited from them, on the commercial market, including during

the war years. The government admits that “war products” includes more than avgas. The government properly accepts responsibility for the remediation costs sufficiently linked to wartime production of toluene, butadiene, Navy fuels, xylenes, and military lubricants, as additional war products. (Docket Entry No. 340-1 at ¶ 214). But the government argues that these war products made up only between 25 percent to 40 percent of the refineries’ crude runs. (*See id.* at ¶ 218). Accordingly, the government argues, it should be responsible only for remediation costs associated with hazardous wastes remaining from 25 percent to 40 percent of the refineries’ crude runs during the periods of federal involvement.

The record evidence undermines the government’s argument that its responsibility is limited to wastes generated by 25 percent to 40 percent of the Baytown and Baton Rouge crude runs during World War II. Instead, the record evidence supports Exxon’s claim that all of the crude runs at Baytown and Baton Rouge during World War II were for war products.

Contemporaneous documents describe both Baytown and Baton Rouge as achieving a 100 percent conversion of crude into war products. A 1943 document entitled “Production of War products at Humble Oil & Refining Company’s Baytown Refinery” describes the Baytown refinery’s operations for the production of war products. (P-40). The document explains the breakdown between “war products” and other products:

On the basis of the current refinery input of 143,780 barrels daily of crude and 6,860 barrels daily of other raw materials, the output of war products is 31.1%. At first glance it might appear that this represents less than one-third conversion to the manufacture of war products but this is hardly true, since, in order that these war products be made, it is unavoidable that other products, such as motor gasoline, kerosene, heating oil, and residual fuel oil, be made as byproducts. . . . The current production of war products represents essentially 100% conversion since all of the crudes and other raw materials taken into the refinery are run specifically for the production of one or more war products.

(*Id.* at A000395).

A 1943 document from Baton Rouge prepared for a war agencies' joint-inspection trip shows a similar result at that refinery. (P-116). A flow chart describes all of the refinery's 120,000 barrels of crude per day flowing into either "critical" or "non-critical" war products, but all flowing into war products. (*Id.* at A000906).

Exxon's expert witnesses agreed that the refineries could not produce only avgas from their crude runs. (*See* Docket Entry No. 319 at 115). Other products, also critical to meet military needs during the war, were necessarily produced as a slate of products in the process that produced high-octane avgas. (*See* P-40 at A000395). The evidence also showed that Exxon sold the government not only the avgas produced at Baytown and Baton Rouge during the war years, but also other products, including the slate of products incidental to avgas production. While some of these products had commercial markets and uses, such as automobile gasoline and heating oil, Exxon sold them to the government for military uses. (*Id.*).

The record shows that the byproducts of the slate produced with avgas could have been characterized as waste. Mr. White testified that had Exxon disposed of the petroleum byproducts necessarily created in avgas production, those byproducts would be characterized as avgas waste. As Mr. White explained, "You scope based on what it takes to get there in the first place. You either could have turned the avgas waste into waste and thrown it away—and by the way, in that case, we wouldn't be having all this debate because everything would be related to avgas. Or you can take that avgas waste and turn it into war products." (Docket Entry No. 293 at 56). In his view, the fact that Exxon continued converting the "avgas waste" into useful byproducts did not change the analysis. (Docket Entry No. 305 at 231–33).

Mr. White referred to *United States v. Shell Oil Co.*, 13 F. Supp. 2d 1018 (C.D. Cal. 1998), *aff'd*, 294 F.3d 1045 (9th Cir. 2002), in which the district court found the federal government

responsible for the cleanup costs for a hazardous substance produced by the acid used in the avgas manufacturing program, despite the fact that the oil companies were able to find a secondary use for the acid in nonavgas products. “Without persuasive evidence that the secondary use of the spent alkylation acid substantially aggravated the waste cleanup problems . . . beyond what they would have been in the absence of that secondary use, the Court cannot say that the secondary use of the spent alkylation acid by the Oil Companies materially aggravated the waste treatment problems.” *Id.* at 1026.

The record supports a similar finding and conclusion here. The record evidence overwhelmingly shows that the federal government directed the owners and operators of the nation’s crude oil refineries to convert their operations to produce as much of the avgas the military desperately needed as fast as possible, and, to a lesser extent, to make products like motor gasoline that also met military needs. (*See* P-70; P-71; P-72; P-73; P-74; P-75; P-76; P-77; P-55). The evidence shows that when the Baytown and Baton Rouge refineries followed the government directives, they sold the avgas the refineries produced and the slate of related products to the government for military use. (*See* P-385). The evidence that the refineries were able to produce other products with avgas, and the potential commercial application of those other products, does not diminish the government’s responsibility for the cleanup of avgas-related waste. The record evidence does not show that the production of these other materials in the slate aggravated the cleanup problems from the avgas production, and, if it did, these other materials were also sold to the government for wartime military needs.

The record supports Exxon’s argument that all these products were used for the war effort. A 1943 Baytown document explained that although all the products it made were not labeled war products, “they are nevertheless playing an important part in the nation’s war economy.” (P-40 at

A000395). Mr. Gravel testified that many “ordinary” products were crucial to the national defense, such as asphalt that was used to construct runways for airplanes; fuel and diesel oil used in the Navy’s ships; and lubricating oils used for various military machines. (*See, e.g.*, Docket Entry No. 272 at 153–54).

Perhaps the second-most important war product to be made at the refineries was motor gasoline. While much of the trial testimony focused on the Petroleum Administration for War’s control over avgas production, the record shows that the Administration also regulated the nation’s supply of motor gasoline, sending specific directives to the refineries to increase or decrease production. (*See* P-70; P-71; P-72; P-73; P-74; P-75; P-76; P-77; P-55). *The History of the Petroleum Administration for War* described 80-octane, all-purpose gasoline, a type of premium motor gasoline manufactured to Army specifications, as a war product, stating that “[i]f 100-octane aviation gasoline was the war’s No. 1 glamor product, there is no question that 80-octane all-purpose gasoline was the No. 1 ‘jack of all trades.’” (P-16 at A000206).

A 1943 telegram from the Petroleum Administration for War’s Director of Refining to the Director of District III explained its position on 80-octane production:

The military procurement services cannot obtain commitments to supply more than a small portion of their requirements for 80-octane all-purpose gasoline under specification 2-103B. Accordingly, it is necessary that you check immediately with each refiner who indicated ability to manufacture this product and find out why he is not offering gasoline meeting 2-103B to the Army, Navy, or Treasury procurement in sufficient quantities. . . . Steps will be taken by you or by this office to remove obstructions interfering with the manufacture of substantially the above total. If the handling of premium grade gasoline as a separate product is causing any trouble, premium can be eliminated from the market. If lack of crudes of required type and quantity is interfering, arrangements can be made to assign crude preferentially subject to the needs of higher priority products to those companies who will produce 80 all purpose gasoline of the new specification. No compromise can be made with the requirements of the ground forces, since in the last analysis, it is just as important that the ground forces have motor fuel as it is for the air services to have aviation gasoline.

(P-73 at 613–615).

The federal government secured contracts for the sale of many of these additional products. A Civilian Production Administration document contains an “alphabetical listing of Major War Supply Contracts” from June 1940 through September 1945, and describes dozens of military contracts with Baytown for other petroleum products, such as lubricating oil, gasoline fuel oil, and kerosene. (*See* P-385 at 3745–55).

The government argues that it is implausible that none of the refineries’ products, excluding avgas, were sold for commercial, civilian use. The government points to Exxon’s expert, Mr. Gravel, who testified that it would be “ridiculous” to say that “there was no . . . gasoline sold into the civilian market.” (Docket Entry No. 270 at 109). The government also notes that during World War II, Humble Oil continued to sell motor gasoline to civilians through Humble-owned service stations. (Docket Entry No. 350-1 at ¶ 215).

The evidence the government cites allows the inference that Humble-owned service stations were operational during the war and sold motor gasoline produced by some refinery. (*See* D-1573 at 14). But the government did not produce or point to evidence of commercial sales from Baytown and Baton Rouge specifically. To the contrary, the 1943 Baytown description explains that much of the Baytown refinery’s production was instead sold to the federal government:

Only approximately 15% of the output of war products is sold directly to the Army and Navy but under the terms of a Product Sales Contract between Humble and Standard Oil Company of New Jersey [the parent company of both Baytown and Baton Rouge] all products not sold directly by Humble in the territory in which it markets are sold to Standard Oil Company of New Jersey. It is understood that practically all of the war products sold to Standard Oil Company of New Jersey under the Product Sales Contract eventually are delivered to the Army, Navy, aircraft engine builders or contractors on jobs directly for the Army or Navy.

(P-40 at 000395).

The government also argues that the production of avgas was “cleaner” than Exxon claims because the refineries used imported feed stocks to create avgas. In the government’s view, the imported feed stocks produced “modest amounts of waste” compared to on-site crude processing, meaning that avgas production was cleaner than Exxon argues. (*See* D-21 at 20, 26; D-20 at 31; D-19 at 3, 13–15, 22–23, 24; D-18 at 6–9, 11–14, 16, 28, 43). In contrast, Exxon argues that over 90 percent of the avgas was produced from crude oil and other on-site feedstocks that required processing on-site. (Docket Entry No. 275 at 200–02). The court finds that Exxon’s evidence and arguments, based on the expert testimony, were more reliable than the government’s, which relied heavily on Dr. Kittrell’s and Dr. Oyekan’s testimony.

The parties describe this dispute as a debate over Dr. Kittrell’s “hierarchical rule.” Under this “rule,” refineries preferentially use imported feedstocks first and refine or process them on-site only as a secondary step. Exxon presented the testimony of John Beath, a chemical engineer and technical expert, who conducted a volume-balance analysis of the two refineries for the World War II period. He concluded that over 90 percent of the avgas produced at the two refineries came from on-site materials. (Docket Entry No. 339 at ¶ 261). This conclusion was supported by the testimony of other experts, including Mr. Lerman, who credibly testified as to several reasons why the refineries would use their crude-sourced feedstocks before imported feedstocks. (*See* Docket Entry No. 273 at 163–65).

The hierarchical rule Dr. Kittrell espoused is not supported by the historical record. The government relied on the testimony of Dr. Oyekan, who testified in place of Dr. Kittrell, that Dr. Kittrell’s theory was supported by the record. Neither Dr. Kittrell nor Dr. Oyekan gave examples or pointed to specific contemporaneous records. (Docket Entry No. 319 at 36–37). When asked to explain Dr. Kittrell’s basis and his own basis for relying on the hierarchical rule, Dr. Oyekan did

not rely on primary sources or the historical record. (*Id.* at 34) (Q: And Dr. Kittrell says he stands by that assumption [that imported stocks would have been used in preference to local material in making aviation gasoline], essentially, based on the notion that we're going to a lot of trouble to move these components around during the war, they're in short supply; and that's how the planned blending program worked; is that correct?" A: "That's correct."). Dr. Oyekan conceded that Dr. Kittrell did not cite to any directives or other correspondence from the federal government during World War II telling refineries to prioritize the use of imported materials over material generated on-site in the production of avgas at Baytown or Baton Rouge. Nor did Dr. Oyekan know of any support in the historical record. (Docket Entry No. 315 at 175). Dr. Oyekan also agreed that he did not see any evidence that either refinery had any segregated tankage so that they could preferentially use imported feedstocks before others. (*Id.* at 174).

In general, the court found Dr. Oyekan's testimony to be primarily based on contemporary refining practices and not reliable on the subject of World War II-era refining and waste production. His testimony relied much less than Exxon's experts' testimony on the contemporaneous historical record. When asked whether he believed that waste generated by a refinery in the wartime period was similar to waste generated by a refinery in 2020, he said "yes," but he acknowledged that he did not have data to make that conclusion. (*Id.* at 183–84).

In short, the record does not support a reduction in the government's allocation of remediation costs based on an assumption that Exxon used off-site feedstocks in the avgas production at Baytown and Baton Rouge. The court finds that the two refineries' entire production during the wartime periods is properly characterized as war products. As a result, the court need not determine whether the imported feedstocks used to produce avgas and the slate of related products during World War II was entirely or only partly to make war materials.

The weight of the credible evidence supports the conclusions that the Baytown and Baton Rouge's production during the period of federal involvement was of "war materials" and that the government has significant responsibility for the costs to remediate the waste generated by that production. The amount of the allocation to each party is addressed in the equitable allocation in Step Three.

b) The Federal Nexus and Relatedness of Response Costs

(1) Baytown

At the bench trial, Exxon presented evidence of response costs at 23 Baytown units.¹³ The government informed the court that it contested the federal nexus for only four of the units: Solid Waste Management Unit 60 (Mitchell Point Landfill); Solid Waste Management Unit 64 (Old Facility "S" / Landfarm); Solid Waste Management Unit 72 (Sludge/Slush Pit); and Solid Waste Management Unit 73 (Sludge/Slush Pit). (Docket Entry No. 270 at 5–8).

Solid Waste Management Unit 60 is a former waste-disposal area located in the southwestern part of the Baytown facility in an area known as Mitchell Point, adjacent to part of Mitchell Bay. (P-714 at A010464; *see also* P-771). The Mitchell Point Landfarm was used for the disposal of oily sludge and dredge spoils from the dock areas of Mitchell Bay, and butyl rubber waste, from approximately 1930 to 1972. (P-714 at A010464; P-501 at A005637–38; Docket Entry No. 274 at 87–90; Docket Entry No. 287 at 107). The government presented a witness who

¹³ The full list of units is: Solid Waste Management Unit 3 (South Landfarm); Solid Waste Management Unit 8 (Separator 10); Solid Waste Management Unit 10 (Upper Outfall Canal); Solid Waste Management Unit 11 (Lower Outfall Canal); Solid Waste Management Unit 22 (Velasco Street Ditch); Solid Waste Management Unit 47 (Waste Clay Pile); Solid Waste Management Unit 59 (Old Sludge Pit); Solid Waste Management Unit 60 (Mitchell Point Landfill); Solid Waste Management Unit 62 (Main Office Building); Solid Waste Management Unit 64 (Old Facility "S" / Landfarm); Solid Waste Management Unit 69 (Old Separator 2); Solid Waste Management Unit 70 (Separator 3M); Solid Waste Management Unit 71 (Old Separator 12); Solid Waste Management Unit 72 (Sludge/Slush Pit); Solid Waste Management Unit 73 (Sludge/Slush Pit); Solid Waste Management Unit 74 (Old Separator 1); Waste Management Area 1; Plume Areas 1–4; Baytown Ordnance Works; and Facilities Operation Area.

testified that aerial photos from 1942 and 1944 showed evidence of waste disposal occurring in the Mitchell Point area. (Docket Entry No. 327 at 207).

The evidence supports two main connections between the government's involvement in this period and the wastes requiring remediation at the Mitchell Point Landfarm. First, the 2000 Perimeter Solid Waste Management Units Investigation Report determined that Solid Waste Management Unit 60 was used for the disposal of butyl rubber waste during the war years. (P-501 at A005637–38). The government-owned Butyl Rubber Plancor 1082, north of Solid Waste Management Unit 60, operated from 1942 to 1955 and generated considerable amounts of hazardous types of butyl rubber-related wastes. (*See* Docket Entry No. 339 at ¶¶ 26–32). This evidence, and the location of the plancor, support finding a federal nexus at this site.

Second, Peter Gagnon, the Environmental Resources Management project manager and engineer who worked on the cleanup at Baytown, demonstrated how the dredge spoils from the Mitchell Bay dock areas adjacent to Solid Waste Management Unit 59 (sludge pit) and Solid Waste Management Unit 69 (Separator 2) were placed in Solid Waste Management Unit 60 during World War II. (P-790 at 17; Docket Entry No. 287 at 105–08).¹⁴ This connects another area of federal

¹⁴ Mr. Gagnon, an environmental engineer and employee of Environmental Resources Management, was responsible in the early 2000s for directing investigations into whether there had been releases from waste-management or disposal activities at Baytown. The investigations were required to comply with the Resource Conservation and Recovery Act. (Docket Entry No. 287 at 22–23). After the investigation, Mr. Gagnon would work with scientists and toxicologists to assess the information and prepare reports for submittal to the state regulatory agency. He would also help develop the remediation action plans if required, and oversee the operation and maintenance of ongoing groundwater managing plans. *Id.* Part of his work involved reviewing the historical records, including the aerial photographs, to determine potential sources for the contamination, as well as the Resource Conservation and Recovery Act permit for the facility and the Environmental Resources Management investigation of the 22 Solid Waste Management Units. (*Id.* at 49, 64).

The court found Mr. Gagnon to be a highly credible witness, knowledgeable both about the historical record and the evidence as to the Baytown contamination and its links to the period of federal involvement.

involvement to the landfill, further supporting finding a federal nexus to the landfill hazardous substances requiring remediation.

The government points to evidence that Solid Waste Management Unit 60 was used as a landfarm from 1957 to 1973 to dispute its connection to all of the contamination at the site. Based on aerial photography, the government estimates that 8,000 cubic yards of oily sludges were disposed of in that unit over the 16-years it was used as a landfarm. (D-109 at 137; D-199 at 18–19). But later landfarming does not eliminate the federal government’s nexus to the hazardous substances contaminating that location as a result of avgas and related product production during World War II. The evidence of later landfarm use supports allocating some of the costs to each party.

The government argues that Exxon’s response costs at this site included steps taken to remediate wastes generated outside the period of federal involvement, for which there is no federal nexus and no basis under CERCLA to allocate costs to the government. According to the government, the remediation implemented at Mitchell Point was limited to removing two small soil “hot spots” and capping most of the former landfarming area, covering much of the eastern half of Solid Waste Management Unit 60. (Docket Entry No. 341 at 153; D-3027 at 42 (showing a composite of D-305 at 15 and D-279 at 56); D-305 at 3–4). But Mr. Gagnon testified that the entire cleanup action was necessary to comply with the federal and state risk-based cleanup standards and requirements, given the elevated levels of particularly toxic constituents in the contaminated areas. Because of that toxicity, Mr. Gagnon explained, it was necessary to do risk assessments of the soil and groundwater contamination to determine if the concentration levels exceeded the risk-based screening levels—“the allowable concentration in soil and groundwater”

—and “whether or not there’s a need to do remediation or if the concentrations present do not pose an unacceptable level of risk.” (Docket Entry No. 287 at 69–71).

Mr. Gagnon also testified about the soil cap that was installed. He explained and demonstrated with slides, including 1942 and 1944 aerial photographs, that the cap was installed over the area where dredge spoils were disposed of in the southeast part of Solid Waste Management Unit 60 during the wartime period. He noted that “the soil cover was on top of where those historic waste management activities occurred.” (P-790 at 10; Docket Entry No. 287 at 78–79).

The government makes much of the fact that a Resource Conservation and Recovery Act cap is driven by contamination in the top two feet of soil, which Mr. Gagnon explained was the case at this unit. (*See* Docket Entry No. 305 at 143–44 (“The presence of contamination in the upper 2 feet was the driver. We needed to protect direct contact for workers at the site.”)). The government argues that there is no basis to allocate its remediation costs for that contamination, which likely occurred after the period of federal involvement ended. But Exxon presented evidence of response costs incurred to address the contamination of the site as a whole. (*See* Docket Entry No. 339 at ¶ 628). While the record shows that the cap directly affects only the uppermost level of contamination, the cap also serves to contain contamination at lower depths. (*See* Docket Entry No. 274 at 94 (“The capping that’s done . . . as part of the cleanup process, what it, essentially, does is it’s a low-[permeability] cap that’s placed on top of it. And the reason why that’s done is because it lowers the rain infiltration into areas beneath which have contaminants of concerns that, essentially lowers the rate of which those contaminants dissolve in groundwater.”)). The record evidence supports finding both a federal nexus and federal involvement in the response costs for Solid Waste Management Unit 60.

Solid Waste Management Unit 64, known as the Old Facility “S” / Landfarm, is a former landfarm in the northeast part of the Baytown facility, near the Velasco Street Ditch. (P-714 at A010479; *see also* P-771). Mr. Gravel testified that Solid Waste Management Unit 64 was used for the disposal of crude oil tank bottoms from approximately 1930 to 1971. (P-740 at 132; *see also* P-714 at A010479–80; P-747 at 89). This connection supports a federal nexus at this location. The government disputed the nexus, but presented no evidence to contradict Mr. Gravel’s conclusion. The record evidence supports finding a federal nexus at Solid Waste Management Unit 64.

Solid Waste Management Units 72 and 73 were earthen sludge pits in the central part of the Baytown Facility. (P-714 at A0105105–10; *see also* P-771). These units were used to store and dispose of oily sludge and spent caustics generated by refinery operations from approximately 1927 to 1956. (P-714 at A010506; P-740 at 132; P-747 at 89). Government experts Ms. Sitton and Mr. Low agreed with this characterization in their reports. (D-279 at 11; Docket Entry No. 341 at 170–71) (Ms. Sitton reiterating this finding in her report); D-3021 at 64). While the government stated in the bench trial that it disputed finding a federal nexus at these units, it presented no evidence to contradict Exxon’s evidence. The record evidence supports finding a federal nexus at Solid Waste Management Units 72 and 73. Exxon admits that these units have not been the subject of a cleanup action, but submitted evidence that Exxon incurred investigation costs for these sites. Those investigation costs are the only costs at this site.

Because the government did not contest the nexus for the remaining units, the court accepts Exxon’s evidence and the testimony of its experts and finds a federal nexus at those units.

The government also contests the relevance of Exxon's response costs at the following units: Solid Waste Management Unit 3 (South Landfarm); Plume Areas 1 through 4; and Tankfarm 3000.

The parties agree that Solid Waste Management Unit 3, also known as the South Landfarm, was an unlined landfill and landfarm located in the southern part of the Baytown facility, and that it received wastes from Separators 10 and 3M. Those Separators operated from the late 1920s until the mid-1980s, which includes the period of federal involvement. (D-74 at 40, 67; D-78 at 1). Mr. Gagnon presented credible and reliable testimony that the response costs addressed wastes that likely dated back to the period of federal involvement. The evidence shows a federal nexus between the plume areas that require remediation and the costs of that remediation at Solid Waste Management Unit 3.

The government argues that because both Separators were in continuous use at Baytown until the mid-1980s, it should be allocated only a small share of the response costs for the South Landfarm. In its posttrial briefing, the government argues that it should be allocated only 18 percent of the response costs associated with the South Landfarm. (Docket Entry No. 340-1 at ¶ 302). Exxon responds that based on the size of the area and the concentration of the contaminants, at least 41 percent of the total waste inventory in the South Landfarm at the time of the cleanup had a federal nexus. (Docket Entry No. 339 at ¶ 553).

The government's approach asks the court to speculate about the precise timing of the wastes found in both the South Landfarm and the two Separators. The record does not sufficiently support this division. The government's argument is adequately and better addressed in applying the equitable factors to arrive at the cost allocation.

The four disputed plumes are specific areas of petroleum-related groundwater contamination at the Baytown facility. They include: (a) Plume Area 1, located under a tankfarm east of Docks 2 and 4 in the southwest part of the Baytown Facility; (b) Plume Area 2, located under an area just north and east of Dock 1 in the southwest part of the Baytown Facility; (c) Plume Area 3, located in the southern part of the refinery between Dock 1 and the Wastewater Oxidation Unit in the south part of the Baytown Facility; and (d) Plume Area 4, located under a tankfarm north of Bayway Drive and south of San Jacinto Avenue in the south central part of the Baytown Facility. Each of these plume areas has one to four separate sub-plumes. (P-518 at A006147; P-740 at 43 (Figure 5), 124; *see also* P-771 (Figure 1, Baytown Map)).

Exxon demonstrated a federal nexus at the areas of these plumes, which the government did not contest, given their proximity to the government-owned plancors. But the government disputes the relatedness of Exxon's response costs, based on evidence of additional sources of contamination after the period of federal involvement. (D-3031 at 32–37). While this evidence is credible, it does not undermine the findings that the contamination and remediation costs in these plume areas had a federal nexus and that the response costs are related to that nexus.

The Baytown Ordnance Works Plume is an area of groundwater contamination at the Baytown Ordnance Works/Tankfarm 3000 site. Exxon presented and pointed to credible and reliable evidence showing sources of contamination dating back to 1942. Government expert Ms. Sitton found evidence of a “potential contamination source” at the Baytown Ordnance Works in a 1942 aerial photograph. In her report, Ms. Sitton stated that, “[a] dark-toned stained area was noted in the northwestern end of this area in 1942.” (D-279 at 8; *see also id.* at 36 (Sep. 27, 1942 Baytown Aerial Photograph); *see also* Docket Entry No. 341 at 166). Ms. Sitton found evidence of waste-type materials disposed of in close proximity to the eastern half of the free-product

contaminant plume during the operation of the Baytown Ordnance Works. As she stated in her report, “[a] disposal area was noted within this area in 1942 and 1944. In 1944, multi-toned mounded material was present in the northeastern portion of this area.” (D-279 at 11; *see also id.* at 36 (Sept. 27, 1942 Baytown Aerial Photograph), 39 (Apr. 11, 1944 Baytown Aerial Photograph)).

The government argues that the court should limit its allocation for the Baytown Ordnance Works Plume Area because additional sources of potential contamination postdated the period of federal involvement. But Mr. Gagnon testified that his investigation of the Tankfarm 3000 Plume Area revealed that while there were minor leaks in the recent past, none were significant contributors to the hydrocarbons in the Plume Area. (Docket Entry No. 287 at 85). Mr. Gagnon’s investigation also revealed that at least five chemicals found in the oil collected in the Tankfarm 3000 Plume Area were materials used at, or present in, the Baytown Ordnance Works while it was owned by the government. (Docket Entry No. 287 at 86–87). The evidence shows a federal nexus to sources of the hazardous substances contaminating the Plume Area and to the response costs Exxon has incurred in that area. As with other areas, this evidence supports finding that both the government and Exxon are responsible for the cleanup.

The court finds these Plume Areas appropriately included in the allocation to the government, based on evidence of a federal nexus to the contamination at the units and to the response costs.

(2) Baton Rouge

At the bench trial, Exxon presented evidence of response costs at seven Baton Rouge units.¹⁵ The government informed the court that it contested the federal nexus for three of these

¹⁵ The full list of units is: Shallow Fill Zone; Solid Waste Management Unit 1 (Rice Paddy Landfarm); Solid Waste Management Unit 2 (Old Silt Pond); Solid Waste Management Unit 19 (APO/Oil

units: Solid Waste Management Unit 1 (the Rice Paddy Landfarm); Solid Waste Management Unit 2 (the Old Silt Pond); and Solid Waste Management Unit 28 (the Propane Storage Area Landfill). (Docket Entry No. 274 at 6–7). The government also challenged its nexus to, and responsibility for, Exxon’s response costs for three of the units: the Shallow Fill Zone; Solid Waste Management Unit 1 (the Rice Paddy Landfarm); and Solid Waste Management Unit 2 (the Old Silt Pond). The substantial overlap between the two groups allows the court to address them together.

The Shallow Fill Zone is an expansive area of contaminated fill material in the Baton Rouge facility. The Zone is adjacent to and east of the Mississippi River and west of the Illinois Central Gulf Railroad lines and the process and tankage areas. The Shallow Fill Zone was the location of a number of waste-processing facilities and waste units, including, for example, a number of oil-water separators, the Old Silt Pond, the Rice Paddy Landfarm, and the Butyl Rubber Waste Landfill. (P-747 at 93–94; P-740 at 211–13; P-404 at A003892–94; P-405 at A003899–902). The Louisiana Department of Environmental Quality considered the Shallow Fill Zone, the Old Silt Pond, and the Rice Paddy Landfarm to be interrelated because the wastes from the Old Silt Pond were a source of hazardous-substance releases to the underlying Shallow Fill Zone and groundwater and to the Rice Paddy Landfarm. (P-596; P-589 at A008310). The court looks at each unit and its connection to the Shallow Fill Zone.

Solid Waste Management Area 2, also known as the Old Silt Pond, was an approximately 20-acre earthen waste-disposal basin, located in the Shallow Fill Zone area on the western part of the Baton Rouge facility adjacent to the Mississippi River and just south of Callaghan’s Bayou. (See P-772 (Figure 2, Baton Rouge Map)). The Old Silt Pond, built in the Shallow Fill Zone,

Water Separators)’ Solid Waste Management Unit 28 (Propane Storage Area Landfill); Solid Waste Management Unit 29 (Butyl Rubber Landfill); and Solid Waste Management Unit 33 (North Batture Landfill and Burning Pit).

began operating in October 1945, and continued operating until it reached capacity in the late 1950s. (Docket Entry No. 339 at ¶ 590).

In the mid-1970s, Exxon solidified the silt previously deposited in the Old Silt Pond and deposited the resulting material in the Rice Paddy Landfarm. (Docket Entry No. 318 at 113–15 (explaining that material from the eastern Old Silt Pond had been excavated and was likely taken to the Rice Paddy Landfarm); D-218 at 139). Exxon then built a “new” Old Silt Pond—a five-acre impoundment on the western side of the Old Silt Pond. (D-89 at 107; D-83 at 37; Docket Entry No. 318 at 114 (“The western third contained an impoundment of liquid and material” in 1974); D-3027 at 21). The eastern portion of what had been the original 20-acre Old Silt Pond was closed and the silt solidified to provide the additional space needed to support the installation of the “Water Clarification Unit of Louisiana.” (D-280 at 7; *see also* D-24 at 36; D-238 at 104 (referring to the construction of the Wastewater Treatment Plant)). Aerial photographs from 1974 show excavation of the easternmost 16 acres of the 20-acre Old Silt Pond as part of this construction. A north/south berm bisects the unit, consistent with the report on the preparations for the Water Clarification Unit of Louisiana. (D-279 at 14 (noting the presence of berm and dredging in the eastern portion of the unit); Docket Entry No. 318 at 114; D-3027 at 21).

By 1976, the treatment plant had been built in the eastern two-thirds of the Old Silt Pond. The western third, where the new impoundment was located, had been drained of most its liquid. (Docket Entry No. 318 at 115; *see also* D-3023). The impoundment was used for the refinery’s waste through the 1980s.

Solid Waste Management Unit 1, also known as the Rice Paddy Landfarm, was an earthen waste-disposal area located in the Shallow Fill Zone area on the western part of the Baton Rouge facility next to the Mississippi River. *See* P-772 (Figure 2, Baton Rouge Map). The Rice Paddy

Landfarm operated from approximately 1976 through 1988. (P-412 at A003999). The area had been used as a landfill and disposal site for hazardous wastes since the early years of the refinery. A 1987 Environmental Protection Agency report determined that the wastes deposited in the Rice Paddy Landfarm area included “sludges and miscellaneous wastes.” (*Id.*). The Rice Paddy Landfarm area was also used to dispose of other wastes or wastewaters from the Old Silt Pond beginning at least as early as the early 1940s.

The government disputes the federal nexus for the contamination and response costs in the Shallow Fill Zone, the Old Silt Pond, and the Rice Paddy Landfarm. The Louisiana Department of Environmental Quality considered the Shallow Fill Zone, the Old Silt Pond, and the Rice Paddy Landfarm to be “interrelated” because the Old Silt Pond was a source of hazardous-substance releases to the underlying Shallow Fill Zone and groundwater, and the Rice Paddy Landfarm was constructed over this area. (P-596; P-589 at A008310).

Exxon presented reliable and credible expert testimony showing the presence of historical contamination in this area. Mr. Gravel explained that the Shallow Fill Zone was gradually filled from the late 1930s to the 1950s with contaminated, oily silt from nearby Callaghan’s Bayou. This Bayou was a waterway that received waste streams from both the refinery and the plancors. A diversion chamber directed overflows from the refinery and plancor sewers to the Old Silt Pond area. (Docket Entry No. 270 at 13–14, 31). Mr. Gravel’s testimony was consistent with, and supported by, Mr. Grip’s analysis of the contemporaneous aerial photographs, which showed overflows of Callaghan’s Bayou—including its pollutants—as well as planned dredging to expand waterfront access to the refinery. The dredging of Callaghan’s Bayou began in 1941 and continued through the 1940s, and Mr. Grip testified that light-toned materials, likely attributable

to dredge spoils, were observed in the photographs of Old Silt Pond area throughout the wartime period. (Docket Entry No. 280 at 44; P-745 at 5).

Michael Pisani, the Environmental Resources Management consultant who worked at Baton Rouge during the clean-up, also testified that the remediation investigations determined that contaminated fill materials were placed in the Old Silt Pond area of the Shallow Fill Zone before the mid-1950s. (Docket Entry No. 281 at 188). Mr. Pisani has both a civil and environmental engineering background and worked for Environmental Resources Management at Baton Rouge on compliance and remediation issues. The court finds Mr. Pisani to be a highly credible and reliable witness, who understood and explained the conditions at the Baton Rouge refinery in light of the applicable regulatory and historical context.

Mr. Gravel also identified the federal nexus to the contaminated wastewaters at the Rice Paddy Landfarm, emphasizing that contaminated fill was moved in the 1970s from the Old Silt Pond to the Rice Paddy Landfarm. (Docket Entry No. 270 at 30). Mr. Gravel also identified a direct source of contamination, a sewer line that ran from the Polymerization Unit and the Light Ends Catalytic Cracking Unit in the Baton Rouge refinery area serving the rubber plancors, to the Rice Paddy Landfarm area. (*Id.* at 36–37). Exxon’s witnesses credibly determined aerial photographs taken during the late 1930s to the 1950s as showing the discharge of liquid materials from the Baton Rouge refinery’s impoundment basin to the discharge pipe south of the Rice Paddy Landfarm. The witnesses also described the photographic evidence that the liquids overflowed and inundated the low-lying southern half of the Rice Paddy Landfarm area and the Shallow Fill Zone. (P-745 at 10).

A 1931 sewer map shows that a 48-inch concrete discharge pipe and sewer line connected to the impoundment basin conveyed the wastewaters from the basin underground and ultimately

discharged the wastewaters to an outfall area that is part of the Shallow Fill Zone, adjacent to the south side of the Rice Paddy Landfarm. (P-277 at 2030; P-745 at 10). The government's aerial photograph expert, Ms. Sitton, did not undermine these conclusions. She acknowledged that she did not have enough information to opine on certain features of the photographs and admitted that she did not consider the historical evidence, such as the sewer map. (Docket Entry No. 341 at 178). The record evidence supports finding a federal nexus to the contamination in the Old Silt Pond and the Rice Paddy Landfarm and therefore the Shallow Fill Zone.

The government also disputes the relatedness of the response costs for these areas. The government focuses on Exxon's argument that a federal nexus to its costs to clean up the Shallow Fill Zone exists because that from the early days of the refinery until 1955, three million cubic yards of waste from the refinery were used to fill the Shallow Fill Zone. (Docket Entry No. 340-1 at ¶ 364; *see* Docket Entry No. 280 at 108). The government argues that aerial photographs from 1937 show that the Shallow Fill Zone had already been filled in before the period of federal involvement began. (Docket Entry No. 318 at 105–06 (observing that the Shallow Fill Zone is vegetated and includes a rail line through the area that became the Rice Paddy Landfarm); *see also* D-3027 at 4). According to the government, waste associated with its involvement is not driving the remediation at the Shallow Fill Zone because wastes with a federal nexus had already been removed. (*See* Docket Entry No. 340-1 at ¶ 365). But Mr. Pisani testified that his 1986 investigation led him to conclude that the hydrocarbon contamination in the Shallow Fill Zone was “from a historical deposition of materials’ throughout the area. (Docket Entry No. 280 at 120). Mr. Pisani found it significant that the concentration of oil and grease increased in the areas further away from the potential contemporary sources of contamination. (*Id.*). His testimony was credible and reliable.

The government argues that the response costs for the Old Silt Pond are associated with the closure of the “new” Old Silt Pond, the five-acre unit that remained in operation after the installation of the Water Clarification facility on the eastern part of the original, 20-acre Old Silt Pond. (D-13 at 213 n.912 (“For the purposes of this report, since the OSP (the 5-acre unit closed by ExxonMobil for which response costs are sought in this litigation) was originally a part of the 20-acre silt pond . . .”). Because of the excavations, solidification, and draining that occurred in this area before the new impoundment was constructed, the government argues that Exxon’s response costs do not address the historical wastes that create the federal nexus. (D-89 at 298 (discussing the post-closure permit for the five-acre surface impoundment)).

Exxon’s remediation documents undermine the government’s argument. The documents state that the closure plan was written for the “five-acre impoundment,” or the “new” Old Silt Pond. (P-595 at A008380). On cross-examination, Mr. Pisani admitted that when he was researching the project, he learned that the area was emptied in the 1980s. (Docket Entry No. 281 at 194). But Mr. Pisani also testified that the depth of the contamination driving the cleanup was significantly deeper than he would expect it to be if it was caused only or primarily by more recent or contemporary sources. (*Id.* at 154–55). He also testified, with support in the record, that the potential source of the contamination was silt from the refinery’s once-through cooling water, a practice that was used during the period of federal involvement until the 1970s. (Docket Entry No. 281 at 158; *see also* P-785 at 138; Docket Entry No. 270 at 82).

The government did not present evidence that the earlier excavations had removed all or most of the previously deposited waste and contamination in those five acres of the Old Silt Pond. Even Mr. Low admitted that “it is possible that there is some waste at the bottom of the current . . . new Old Silt Pond that stems from the period of time from 1945 through 1960 of silt deposit,”

though he argued that the waste “is not terribly meaningful.” (Docket Entry No. 324 at 25). There is credible and sufficient evidence of the federal nexus to the remediation efforts and costs Exxon has incurred.

The government similarly questioned the relatedness of the response costs associated with the Rice Paddy Landfarm. Mr. Pisani testified that Exxon attempted to address the contamination found in the Rice Paddy Landfarm with natural degradation, which remediates only the top few feet of contamination. But because Exxon found contamination in the underlying fill materials deposited in earlier periods, Exxon had to stop the natural degradation efforts and install a Resource Conservation and Recovery Act cap over the site to contain the underlying waste and contaminated fill materials. (Docket Entry No. 281 at 161; P-622 at A008542).

Mr. Low argued that these efforts were largely driven by wastes deposited in the area in the 1970s and 1980s, and that the government’s allocation at Baton Rouge should be reduced by 12.8 percent to reflect the exclusion of the Shallow Fill Zone response costs. (Docket Entry No. 324 at 31). Given the Louisiana Department of Environmental Quality’s conclusion that the Shallow Fill Zone, the Old Silt Pond, and the Rice Paddy Landfarm are interrelated, the three sites are properly considered together. The court finds the testimony of Exxon’s experts to be credible and reliable as to the connection between these three sites and the federal involvement at the refineries. As at Mitchell Point, the Resource Conservation and Recovery Act cap is connected to, and in part driven by, the contamination at the lower depths at the site, as well as by contamination closer to the surface. This conclusion is supported by both aerial photography experts, including Ms. Sitton.

Solid Waste Management Unit 28, known as the Propane Storage Area Landfill, is a former unlined landfill that was located on the south-central part of the Baton Rouge Facility. (See P-772

(Figure 2, Baton Rouge Map)). After the landfill stopped receiving wastes, it was covered in concrete and part of a propane storage unit was constructed at that location. (P-430 at A004078).

The Propane Storage Area Landfill was used to dispose of acid sludge and other wastes, and operated from approximately 1910 to the early 1950s, including the wartime period of 1941 to 1955. (P-412 at A004014; P-431 at A004085; P-740 at 221). Ms. Sitton concurred that Solid Waste Management Unit 28 was used for waste disposal during the wartime period. Her expert report included the statement that “[i]n 1931 and 1941[,] this area contained a large vertical tank surrounded by a berm. By 1945, the vertical tank had been removed and multi-toned material was visible within the bermed area.” (D-279 at 17).

As with several of the units at the Baytown refinery, the government informed the court that it was disputing the federal nexus to the contamination and remediation costs at this unit. But the government neither presented nor pointed to evidence undermining Mr. Gravel’s conclusion of a federal nexus. The credible and reliable record evidence supports finding a federal nexus at Baton Rouge Solid Waste Management Unit 28.

The court recognizes the difficulty of determining what happened 50 to 100 years ago and its impact on the degree of contamination up to the present. The court does not expect either side to determine with precision the composition or source of the contamination across the years. Credible record evidence shows that the contamination in these areas of the Baton Rouge facility dates back at least to the 1940s, including the period of federal involvement. The court will address the evidence supporting the nature and extent of additional, more recent sources of contamination, and the amount of remediation costs allocated to each party, in the equitable allocation analysis.

4. Step Three: The Equitable Allocation

The third step of the production-based allocation requires the court to equitably divide the wartime-related costs that it determines to be subject to allocation. Both parties started with the court's Phase 1 holding that the government was not an owner or operator of the refineries for CERCLA purposes, but that the government and Exxon jointly operated the planters at the refineries. *See Exxon I*, 108 F. Supp. 3d at 532. The court also held that the refineries and planters were part of a single facility at each site, which "subject[s] the government to liability for the refineries regardless of whether the government actually operated them." *Id.* at 517–21.

The parties proposed their own equitable divisions, based on the factors the court explained in its 2018 summary judgment opinion it would consider at this phase: the "Gore" factors; the "Torres" factors; and five factors of the court's choosing.

The Gore factors include: (i) the ability of the parties to demonstrate that their contribution to a discharge, release or disposal of a hazardous waste can be distinguished; (ii) the amount of the hazardous waste involved; (iii) the degree of toxicity of the hazardous waste involved; (iv) the degree of involvement by the parties in the generation, transportation, treatment, storage, or disposal of the hazardous waste; (v) the degree of care exercised by the parties with respect to the hazardous waste concerned, taking into account the characteristics of such hazardous waste; and (vi) the degree of cooperation by the parties with the federal, state or local officials to prevent any harm to the public health or the environment. *See Valbruna Slater Steel Corp. v. Joslyn Mfg. Co.*, 934 F.3d 553, 566 (7th Cir. 2019) ("Courts usually look to the 'Gore factors'—named after then-Congressman Al Gore—to decide allocation."); *see also TDY Holdings, LLC v. United States*, 885 F.3d 1142, 1146 n.1 (9th Cir. 2018) (listing factors).

The Torres factors include: “(1) the extent to which the clean-up costs are attributable to wastes for which a party is responsible; (2) the party’s level of culpability; (3) the degree to which the party benefitted from disposal of the waste; and (4) the party’s ability to pay its share of the costs. *El Paso Nat. Gas Co., LLC v. United States*, 390 F. Supp. 3d 1025, 1053 (D. Ariz. 2019)

The five added factors are: the knowledge and acquiescence of the parties in the contamination-causing activities; the value of the activities to the national defense efforts; the parties’ roles at the refineries and chemical plants; the parties’ intent to allocate liability; and post-war waste-handling improvements. *See Exxon II*, 335 F. Supp. 3d at 944–48.

The parties’ proposed allocations, and the court’s application of the equitable factors, are analyzed below.

a) Exxon’s Proposal

Exxon proposes that the government be allocated a 40 percent share of the response costs for both avgas and other war productions assigned to the periods of federal involvement at both Baytown and Baton Rouge. (Docket Entry No. 339 at ¶¶ 718, 719, 763, 764). Mr. White proposed 40 percent based on his “benchmarking” exercise, in which he compared the facts here to the facts in other CERCLA decisions.¹⁶ The 40 percent figure represents a downward departure from Exxon’s initial 60 percent proposal to reflect the court’s 2015 holding that limited the government’s liability under CERCLA. (P-761 at 45).

¹⁶ Mr. White described his benchmarking process as “trying to screen a bunch of different decisions to figure out what is a good analogue to this case so that you don’t end up randomly making some subjective decision, but instead create a data set or a set of decisions where the fact patterns are similar and it allows you to see what other people have grappled with to come up with those answers and what they are and it informs you on how to set that level in the instant case.” (Docket Entry No. 305 at 245). Mr. White’s description of the cases he used for benchmarking purposes can be found at Docket Entry No. 305 at 248–255.

The CERCLA allocation model Mr. White developed for the Baytown facility uses an additional 20 percent level of government involvement for the plancors, bringing the allocation to 60 percent. This reflects the government's ownership of the plancors in addition to operational responsibility. (Docket Entry No. 293 at 62; *see also* P-763 at BAYTOWN-018). The model assigns the government a 60 percent share of responsibility for the refinery's naphtha flows developed for, and sent to, the Baytown Ordnance Works to manufacture TNT during World War II. (Docket Entry No. 293 at 62–63; *see also* P-763 at BAYTOWN-018; P-761 at 66–67). The model assigns the government a 25 percent share of the refinery capacity in a typical year for the Baytown Ordnance Works operations, reflecting the fact that the Baytown refinery produced 50,000 barrels per day of naphtha that it distributed to the Baytown Ordnance Works to manufacture TNT during World War II. (Docket Entry No. 293 at 62–63; P-791 at 106–09). The model also accounts for the 91 percent of product from the Baytown Ordnance Works that was returned to the refinery for further processing to manufacture avgas and other war products during World War II. (P-791 at 106–09).

At Baton Rouge, the CERCLA allocation model Mr. White used does not attribute an additional level of involvement to the government for the plancors the government owned and operated. (Docket Entry No. 293 at 103–05). Mr. White explained that because he did not have the same level of detailed data for Baton Rouge that he had for the Baytown plancors, he decided not to allocate any added costs to the government for the Baton Rouge plancors. (*Id.* at 104–05).¹⁷

For purposes of assigning costs to the government for its role in the refineries' delay in implementing waste-improvement processes, Mr. White assigned the government a weighted

¹⁷ Mr. White went on to clarify that there was detailed data available for the Baton Rouge plancors' contribution to waste in the Monte Sano Bayou, but as waterways were excluded from consideration at the bench trial, the costs were not included in his calculations. (Docket Entry No. 293 at 105).

share of involvement in the CERCLA allocation for the Baytown facility from 1942 to 1945. The weighted share for the delay was 45.93 percent. (Docket Entry No. 293 at 81; *see also* P-791 at 132). Mr. White assigned the government a 40 percent level of involvement in the CERCLA allocation for the Baton Rouge facility during the 1942-1945 period to account for the delay. The CERCLA level of involvement to the government for the delay period was 40 percent. (P-791 at 171).

Mr. White used an allocation method under both CERCLA and the contracts for avgas production at the Baytown facility. (Docket Entry No. 293 at 17–19; *see also* P-791 at 45). The avgas contract allocation for the Baytown facility assigned 100 percent of avgas-related costs to the government during World War II. (Docket Entry No. 293 at 6, 17–20; *see also* P-791 at 45). The avgas contract allocation that Mr. White developed for the Baytown facility takes into account that producing avgas required producing a broad slate of other products also used for the war. The remediation costs for the hazardous substances generated by that production are properly covered by the avgas contract allocation. (Docket Entry No. 293 at 6).

Mr. White's avgas contract allocation for the Baytown refinery results in an incremental contract allocation of 5.84 percent to the government during the covered period. (P-763 at BAYTOWN-024). Mr. White's avgas contract allocation for the Baytown refinery extends coverage for the elements measured in Mr. White's delay calculation, because those calculations are based on decisions made during the period covered by the avgas contracts. (Docket Entry No. 293 at 13; P-763 at BAYTOWN-024).

Mr. White's avgas contract allocation for the Baton Rouge refinery results in a 7.41 percent allocation to the government during the delay-covered period. (P-763 at BATON ROUGE-022). The avgas contract allocation for the Baton Rouge refinery results in an incremental contract

allocation of 4.44 percent to the government during the delay-covered period. (P-763 at BATON ROUGE-022).

The results of Mr. White's allocation are as follows:

At Baytown, the government would be liable under CERCLA for an allocated share of 29.67 percent for past response costs incurred at the refinery and 36.54 percent for past response costs incurred at the Baytown Ordnance Works and Tankfarm 3000 Area. The following chart shows Mr. White's Baytown allocation:

Time Period	Cost	Share of Total Cost	CERCLA Allocation				Contract Allocation (Increment) to U.S.		Final Allocation (CERCLA + Contract) to the U.S.		
			Exxon		U.S.		Cost	Share of Total Cost	Cost	Share of Total Cost	
			Cost	Share of Total Cost	Cost	Share of Total Cost					
A	B	C	D	E	F	G	H	I	J	K	
1. BAYTOWN SITE ALLOCATION - REFINERY											
EARLY PERIOD	1920-01 - 1941-04	\$ 18,832,615	41.33%	\$ 18,832,615	41.33%	\$ -	0.00%	\$ -	0.00%	\$ -	0.00%
WORLD WAR II	1941-05 - 1945-08	\$ 7,851,171	17.23%	\$ 4,290,614	9.42%	\$ 3,560,557	7.81%	\$ 3,694,129	8.11%	\$ 7,254,686	15.92%
POST-WW2 PRE-KOREA	1945-09 - 1950-06	\$ 9,652,353	21.18%	\$ 7,957,128	17.46%	\$ 1,695,225	3.72%	\$ 1,511,616	3.32%	\$ 3,206,841	7.04%
KOREA	1950-07 - 1953-07	\$ 3,504,737	7.69%	\$ 1,977,718	4.34%	\$ 1,527,019	3.35%	\$ 758,069	1.66%	\$ 2,285,088	5.01%
POST-KOREA PLANCOR	1953-08 - 1955-06	\$ 1,235,455	2.71%	\$ 968,204	2.12%	\$ 267,251	0.59%	\$ 261,566	0.57%	\$ 528,817	1.16%
DELAY ONLY	1955-07 - 1958-12	\$ 1,307,156	2.87%	\$ 1,195,106	2.62%	\$ 112,050	0.25%	\$ 131,933	0.29%	\$ 243,983	0.54%
		\$ 23,550,873	51.68%	\$ 16,388,770	35.97%	\$ 7,162,103	15.72%	\$ 6,357,313	13.95%	\$ 13,519,416	29.67%
LATE PERIOD	1959-01 - 2015-12	\$ 3,183,915	6.99%	\$ 3,183,915	6.99%	\$ -	0.00%	\$ -	0.00%	\$ -	0.00%
TOTAL		\$ 45,567,403	100.00%	\$ 38,405,300	84.28%	\$ 7,162,103	15.72%	\$ 6,357,313	13.95%	\$ 13,519,416	29.67%
2. BAYTOWN SITE ALLOCATION - BOW											
EARLY PERIOD	1920-01 - 1941-04	\$ -	0.00%	\$ -	0.00%	\$ -	0.00%	\$ -	0.00%	\$ -	0.00%
WORLD WAR II	1941-05 - 1945-08	\$ 1,609,222	29.36%	\$ 643,689	11.74%	\$ 965,533	17.61%	\$ 629,593	11.49%	\$ 1,595,126	29.10%
POST-WW2 PRE-KOREA	1945-09 - 1950-06	\$ 2,223,897	40.57%	\$ 2,139,325	39.03%	\$ 84,572	1.54%	\$ -	0.00%	\$ 84,572	1.54%
KOREA	1950-07 - 1953-07	\$ 807,490	14.73%	\$ 404,494	8.84%	\$ 322,996	5.89%	\$ -	0.00%	\$ 322,996	5.89%
POST-KOREA PLANCOR	1953-08 - 1955-06	\$ 284,648	5.19%	\$ 284,648	5.19%	\$ -	0.00%	\$ -	0.00%	\$ -	0.00%
DELAY ONLY	1955-07 - 1958-12	\$ 301,168	5.49%	\$ 301,168	5.49%	\$ -	0.00%	\$ -	0.00%	\$ -	0.00%
		\$ 5,226,425	95.35%	\$ 3,853,324	70.30%	\$ 1,373,101	25.05%	\$ 629,593	11.49%	\$ 2,002,694	36.54%
LATE PERIOD	1959-01 - 2015-12	\$ 254,915	4.65%	\$ 254,915	4.65%	\$ -	0.00%	\$ -	0.00%	\$ -	0.00%
TOTAL		\$ 5,481,340	100.00%	\$ 4,108,239	74.95%	\$ 1,373,101	25.05%	\$ 629,593	11.49%	\$ 2,002,694	36.54%
3. BAYTOWN SITE ALLOCATION - REFINERY & BOW COMBINED											
EARLY PERIOD	1920-01 - 1941-04	\$ 18,832,615	36.89%	\$ 18,832,615	36.89%	\$ -	0.00%	\$ -	0.00%	\$ -	0.00%
WORLD WAR II	1941-05 - 1945-08	\$ 9,460,393	18.53%	\$ 4,934,303	9.67%	\$ 4,526,090	8.87%	\$ 4,323,722	8.47%	\$ 8,849,813	17.34%
POST-WW2 PRE-KOREA	1945-09 - 1950-06	\$ 11,876,250	23.26%	\$ 10,096,453	19.78%	\$ 1,779,797	3.49%	\$ 1,511,616	2.96%	\$ 3,291,413	6.45%
KOREA	1950-07 - 1953-07	\$ 4,312,227	8.45%	\$ 2,462,212	4.82%	\$ 1,850,015	3.62%	\$ 758,069	1.48%	\$ 2,608,084	5.11%
POST-KOREA PLANCOR	1953-08 - 1955-06	\$ 1,520,104	2.98%	\$ 1,252,853	2.45%	\$ 267,251	0.52%	\$ 261,566	0.51%	\$ 528,817	1.04%
DELAY ONLY	1955-07 - 1958-12	\$ 1,608,324	3.15%	\$ 1,496,274	2.93%	\$ 112,050	0.22%	\$ 131,933	0.26%	\$ 243,983	0.48%
		\$ 28,777,298	56.37%	\$ 20,242,094	39.65%	\$ 8,535,204	16.72%	\$ 6,986,906	13.69%	\$ 15,522,110	30.41%
LATE PERIOD	1959-01 - 2015-12	\$ 3,438,830	6.74%	\$ 3,438,830	6.74%	\$ -	0.00%	\$ -	0.00%	\$ -	0.00%
TOTAL		\$ 51,048,743	100.00%	\$ 42,513,539	83.28%	\$ 8,535,204	16.72%	\$ 6,986,906	13.69%	\$ 15,522,110	30.41%
Notes: See P-763 at BAYTOWN-017 for "1. Baytown Site Allocation - Refinery" data; see P-763 at BAYTOWN-035 for "2. Baytown Site Allocation - BOW". Data in Columns A through G, and I are taken directly from the source. Column H is the dollar value determined by multiplying Column I value by total cost for that area. Column J and K are simply the addition of their respective components (J = F + H), (K = G + I). Note that block 3, "3. Baytown Site Allocation - Refinery & BOW Combined" is the sum of block 1 (refinery) plus block 2 (BOW).											

(Docket Entry No. 339 at ¶ 749); *see also* Appendix A.

At Baton Rouge, the government would be liable under CERCLA for an allocated share of 19.4 percent for past response costs incurred at the refinery. The following chart shows Mr. White's Baton Rouge allocation:

Time Period	Cost	Share of Total Cost	CERCLA Allocation				Contract Allocation (Increment) to U.S.		Final Allocation (CERCLA + Contract) to the U.S.		
			Exxon		U.S.		Cost	Share of Total Cost	Cost	Share of Total Cost	
			Cost	Share of Total Cost	Cost	Share of Total Cost					
A	B	C	D	E	F	G	H	I	J	K	
BATON ROUGE SITE ALLOCATION											
EARLY PERIOD	1910-01 - 1941-04	\$ 10,631,616	40.82%	\$ 10,631,616	40.82%	\$ -	0.00%	\$ -	0.00%	\$ -	0.00%
WORLD WAR II	1941-05 - 1945-08	\$ 2,684,061	10.31%	\$ 1,610,436	6.18%	\$ 1,073,624	4.12%	\$ 1,405,285	5.40%	\$ 2,478,909.60	9.52%
POST-WW2 PRE KOREA	1945-09 - 1950-06	\$ 3,945,484	15.15%	\$ 3,231,777	12.41%	\$ 713,707	2.74%	\$ 1,070,560	4.11%	\$ 1,784,266.42	6.85%
KOREA	1950-07 - 1953-07	\$ 1,758,812	6.75%	\$ 1,055,287	4.05%	\$ 703,525	2.70%	\$ 86,702	0.33%	\$ 790,226.80	3.03%
		\$ 8,388,357	32.21%	\$ 5,897,501	22.64%	\$ 2,490,856	9.56%	\$ 2,562,547	9.84%	\$ 5,053,403	19.40%
LATE PERIOD	1953-08 - 2015-12	\$ 7,026,157	26.98%	\$ 7,026,157	26.98%	\$ -	0.00%	\$ -	0.00%	\$ -	0.00%
TOTAL		\$ 26,046,130	100.00%	\$ 23,555,274	90.44%	\$ 2,490,856	9.56%	\$ 2,562,547	9.84%	\$ 5,053,403	19.40%
Notes: See P-763 at BATON ROUGE-017 for "Baton Rouge Site Allocation" data; Data in Columns A through G, and I are taken directly from the source. Column H is the dollar value determined by multiplying Column I value by total cost for that area. Column J and K are simply the addition of their respective components (J = F + H), (K = G + I).											

(Docket Entry No. 339 at ¶ 789); *see also* Appendix B.

b) The Government's Proposal

For the bench trial, the government used Mr. White's production-based approach that the court had earlier found to be the more reliable and credible allocation method. *See Exxon II*, 335 F. Supp. 3d at 941. The government asks the court to make changes to that method to adjust for what the government sees as the more reliable and credible record evidence supporting the amounts each party must pay. The government's approach deviates most from Exxon's at Step One and Step Two of the allocation method. At Step Three, the government's proposal is relatively close to Exxon's proposal.

The government proposes that it receive a 100 percent allocation of remediation costs for avgas; 40 percent for other war products; and 67 percent for the Baytown Ordnance Works. (*See* Docket Entry No. 340-1 at ¶¶ 288–90). The government states that Exxon "agrees" with this 100 percent allocation for avgas contamination during the years of federal involvement. The

government is correct in the sense that the contract allocation leads to the same result, but the parties use different methods to get there.

Both parties agree to allocate 40 percent of the remediation costs for war products during the war years to the government, but the government adopts a more limited view of war products, resulting in a much smaller allocation of costs to that category. At the Baytown refinery during World War II, Mr. Low allocates 14 percent of costs to avgas, at a 100 percent government share, 30 percent to other war products, at a 40 percent government share, and 56 percent to civilian products, at a 0 percent government share. (Docket Entry No. 326 at 167; *see also* D-3031 at 106, 109). At the Baton Rouge refinery, during World War II, Mr. Low allocated 19 percent to avgas, at a 100 percent government share, 30 percent to other war products, at a 40 percent government share, and 51 percent to civilian products, at a 0 percent government share. (Docket Entry No. 326 at 167; *see also* D-3031 at 105). Mr. Low reduces the percentage of costs allocated to avgas to reflect the government's theory that the refineries used avgas imports that generated less waste. (D-3031 at 109). The government also proposes a unit-by-unit equitable allocation to reflect its criticisms of the federal nexus and the lack of causal relationship between federal involvement and the response costs for certain units. Because the court addressed the unit-specific information at Step Two, that need not be discussed again. *See supra* II.B.3.b).

Accounting for the changes the government proposed in the earlier allocation steps in its proposal for the impact of the equitable factors, the government proposes the following allocation of its liability for the remediation costs at issue: for the Baytown refinery, 2.36 percent; for the Baytown Ordnance Works, 1.86 percent; and for the Baton Rouge refinery, 0.46 percent.

A chart of the competing allocation percentages is set out below for side-by-side comparison:

	Exxon's Proposal for Government Allocation	Government's Proposal for Government Allocation
Baytown	29.67%	2.36%
Baytown Ordnance Works	36.54%	1.86%
Baton Rouge	19.4%	0.46%

c) Analysis: The Court's Equitable Allocation, Including the Equitable Factors

The analysis of putting the various data points together with the equitable factors is set out below, factor by factor, and then together.

(1) Knowledge and Acquiescence of the Parties in the Contamination-Causing Activities

The court substantially addressed this factor in its 2018 summary judgment opinion, stating as follows:

The record evidence shows that the United States, through its orders and directives that Exxon maximize avgas production, knew that the production would generate substantial amounts of hazardous wastes. Gregory Kipp testified that “the [United States] recognized the consequences its directives had on waste generation and disposal. Indeed the [Petroleum Administration for War] recruited ‘its executive and technical personnel . . . mainly from oil companies,’ and so staffed the agency with personnel well-qualified to understand the current disposal capacity of the industry—and who also knew that increased production would necessarily create increased waste, and that new wartime production demands would create new and increasingly toxic forms of waste.” . . . Although the United States did not own or operate either refinery, it was aware of and acquiesced to the contamination-causing activities at the refineries.

Exxon II, 335 F. Supp. 3d at 944.

The court finds that the full record, including the evidence presented at the bench trial, amply supports the court's earlier finding that the government was aware of, and acquiesced in, the contamination-causing activities at the Baytown and Baton Rouge facilities during the period

of federal involvement. As the historian witnesses made clear, the Petroleum Administration for War was fully aware of the nature of full-bore, full-capacity avgas production and the wastes it would generate, either as byproducts or pollution.

According to the government-written and published document, *The History of the Petroleum Administration for War*, the Administration knew that the production of avgas and other petroleum products, such as motor gasoline, were not mutually exclusive. Some of the products were produced as part of the slate that avgas production entails. As the *History* states, “there were many in authority who failed to understand the nature of the production problem involved and who clung to the view that ‘gasoline is gasoline,’ apparently believing that the refineries had only to cease shipments to civilians in order to turn out an ocean of 100-octane.” (P-16 at A000182). The authors went on to explain that the 100-octane program was different from other programs because of the byproducts inherently produced:

A fifth difference in the 100-octane program, as compared with others, is the fact that 100-octane cannot be produced alone. Its production is essentially a procedure for extracting by-products of petroleum refining operations. The by-products are of great value, but they are still byproducts of petroleum in various forms, caught as the crude oil goes through the refinery in process of being broken down into its parts, purified and concentrated. And Exxon’s predecessors sold the products, including those that could have been sold for civilian commercial as well as for military use, to the armed forces for military purposes.

(*Id.* at A000195). *The History* was written shortly after the end of World War II. It draws on wartime records and information; it is essentially a contemporaneous account. It is a highly credible source of evidence for the government’s knowledge during this period.

The record also clearly establishes that the Petroleum Administration for War and other government agencies purposefully and consistently allocated essential raw materials to ensure maximum war product production, not to ensure proper waste handling. A 1942 War Production Board, War and Navy Departments memo issued to division engineers stated that all construction

“shall be of the cheapest, temporary character with structural stability only sufficient to meet the needs of the service which the structure is intended to fulfill during the period of its contemplated war use.” (P-708 at A010403). A 1944 Petroleum Administration for War memo sent to “all petroleum refiners,” stated that:

[u]p to the present time the Refining Industry has been essentially restricted to new construction work which represented the barest minimum which would achieve the end of supplying the most critical war products. This policy has been necessitated by the extreme demands for construction materials and construction labor which the war had placed upon the entire country’s economy.

(P-85). As a result, the government restricted or cut off the refineries’ access to the materials and skilled labor necessary to improve hazardous-substance processing and disposal.

At the same time, the government instructed the refineries to maximize the production of avgas and other war materials, operating all day, every day, minimizing delays, and avoiding partial, much less plant-wide, shutdowns for maintenance and repairs. The government did so knowing that the increase in the volume and rate of production, while definitely much needed, would generate more hazardous wastes. The government did so knowing that there was scant preparation for managing and disposing of those increased wastes without environmental contamination.

The government also knew the limits of the handling capacity of the federally owned plancors. A May 16, 1946, letter from the Deputy Director of the Office of Rubber Reserve described the situation at the plancors’ industrial waste-treatment and disposal facilities: “Many of the facilities were designed to meet only the minimum requirements because the more comprehensive program in many instances could not be justified in the war emergency and the scarcity of critical materials.” (P-235).

The court does not suggest that the government focused on, or knew, or that it could or did predict, the full impact the expanded wartime production and limited waste-handling procedures would have on the environment. But even during the period of federal involvement, the government knew that the increased wartime material production meant increased hazardous-waste generation and deposits in ground areas near sensitive bodies of water, and in the ponds, bayous, or bays that fed major bodies of water. The government knew that the war material production it required, directed, or participated in during the years of federal involvement had a lasting and extreme environmental impact. The U.S. Army Corps of Engineers' concern about the Baton Rouge Facility's pollution of the Mississippi illustrates this knowledge and acquiescence. (*See* P-109).

The government made the decision that winning the war was a benefit that outweighed the environmental risks and costs. We won the war, leaving hazardous waste contamination at the refineries that helped the war victory. The taxpayers benefitted when the war was won; they should now pay their share of the costs to clean up the contamination. The government's knowledge and acquiescence supports a substantial allocation of the response costs to the government.

(2) The Value of the Activities to the National Defense Efforts

The parties do not dispute that petroleum engineering played a significant role in the American victory in World War II. As Ralph Davies, the Deputy Administrator in the Petroleum Administration for War, told the United States Senate Special Committee after the war's end, "[o]n all counts, 100-octane was the lifeblood of the United Nations in the air." (P-17 at A000235).

Dr. Brigham presented evidence that the refineries, nationally as well as at Baytown and Baton Rouge, profited during the war periods, in part because of heavy federal investment in the industry. Dr. Brigham characterized the relationship between the federal government and the

refineries as a cooperative one, in which the oil industry and the government stood to benefit from mutual involvement. That does not diminish the value of petroleum industry's contribution to the nation's military success. The problem is how to quantify that value.

Shell Oil, 13 F. Supp. 2d at 1020, is instructive. In that CERCLA case, the court also had to "take a long delayed hindsight view and make an appraisal of what was done to win a war." *Id.* The court found that allocating to the government 100 percent of the costs to clean up the hazardous-waste contamination resulting from the avgas and war material production during the war "simply places a cost of the war on the United States and thus on society as a whole." *Id.* at 1027. That applies here as well. Baytown and Baton Rouge, two of the nation's largest refineries during World War II, were responsible for a significant share of federal wartime supplies. Baytown was the largest manufacturer of avgas by 1939 and produced 40 percent of the nation's nitration-grade toluene. (P-150; *see also* P-149 at A00133).

The value of these activities to the American military effort supports a significant allocation to the government.

(3) The Parties' Roles at the Refineries and Chemical Plants

Applying this factor requires the court to consider the parties' respective roles as operators at the two refineries and associated chemical plants. Although the refinery and chemical plants at each of the two locations are treated as a single CERCLA facility, the court held in Phase 1 that the government was not a CERCLA "operator" at the refineries because it did not exercise direct control over the production of avgas components or waste disposal at the refineries. *Exxon I*, 108 F. Supp. 3d at 525–30. By contrast, the court held that the government was an operator of the Baytown and Baton Rouge plantors because "[t]he government's direction of certain aspects of

the synthetic-rubber plant operations and the waste disposal activities make it liable as a prior operator.” *Id.* at 531.

Exxon’s historian witness, Mr. Gravel, presented significant and persuasive evidence of the government’s involvement in the production of avgas, synthetic rubber, and other war materials during World War II and the Korean War. Dr. Brigham, the government’s historian, confirmed much of Mr. Gravel’s testimony. They painted a vivid, and largely consistent, picture of how broad and deep the government’s involvement was. That involvement ranged from providing economic pressure and incentives for the refinery owners to enter into contracts with the government to produce avgas and other war materials, to requiring the refineries to maximize their production efforts and outcomes, to limiting the refineries’ access to raw materials and skilled labor. But the government’s involvement in the refineries falls short of that necessary for liability as an operator. The record evidence does not cause the court to change its 2015 holding that the government was not an operator of the refineries and accordingly not liable for the hazardous wastes at the refineries as separate sites.

This holding does not undermine the validity of the allocation to the government. The allocation method the court applies accounts for the government’s extraordinary involvement in the two refineries during the period of federal involvement. The method treats all crude runs as directed toward war products; treats most of the sites in which there were waste streams during the period of federal involvement as having a federal nexus and the response costs as related to that nexus; penalizes the government for the decisions to deny waste-improvement projects during World War II; recognizes Exxon’s role in pre-war failures to improve waste-handling processing and structures; and credits Exxon for its comprehensive and expedient steps to design, build, and implement waste-handling programs after the war was over. The court finds this model accurate

and reliable, and the testimony and evidence supporting it credible, despite the difficulties in looking back almost a century to reconstruct the impact of, and responsibility for, what both parties did or failed to do.

At the same time, the court recognizes that the purpose of CERCLA is to impose the costs to clean up hazardous substances on “owners and operators of facilities at which hazardous substances are located.” *See* 42 U.S.C. § 9607(a)(1)–(2). Both the Baytown and Baton Rouge refineries and chemical plants are properly treated as single facilities. The evidence amply established that the combination of the high temperature and pressures, and the nature of elements needed, for the refining process, combined with swiftly expanded production of avgas and other products, an aging infrastructure, and deferred or delayed maintenance and repair, produced large amounts of waste from the turn of the 20th century through the period of federal involvement and after.

The refineries continued to operate through the 1980s, when the investigations leading to this case began, and continue to operate today. They continue to produce waste and contribute to the response costs Exxon incurred and will incur. Exxon’s post-war activities, even considering its waste-processing improvement program, support allocating Exxon a higher equitable share to reflect its responsibility as owner and operator at both facilities.

This factor supports a lower equitable share for the government.

(4) The Parties’ Intent to Allocate Liability

Applying this factor requires the court to consider whether there is an indemnification agreement demonstrating “the parties’ intent to allocate liability among themselves.” *Halliburton Energy Servs., Inc. v. NL Indus.*, 648 F. Supp. 2d 840, 863 (S.D. Tex. 2009). The evidence

included copies of three contracts for producing avgas between the Baytown and Baton Rouge refineries and the Defense Supplies Corporation during World War II.¹⁸

The first avgas supply contract was between the Defense Supplies Corporation and Standard Oil of New Jersey, and extended from January 13, 1942, to February 28, 1946. (P-52 at A000484). The parties refer to this avgas supply contract as the Master Suppliers Contract. This contract provided that both Humble and Standard Oil of Louisiana were two of Standard Oil of New Jersey's "Suppliers" and that the avgas manufactured at both the Baytown and Baton Rouge refineries under the contract with Standard Oil of New Jersey would be supplied by Standard Oil of New Jersey to the Defense Supplies Corporation. (*Id.* at A000472).

The second avgas contract, effective from February 4, 1942, to February 28, 1946, between the Defense Supplies Corporation and Humble, called for Humble to produce avgas at the Baytown refinery for sale to the Corporation. (P-53 at A000509). This contract provided that Humble was one of Standard Oil of New Jersey's "Suppliers" of avgas for ultimate sale to the Defense Supplies Corporation, and that Humble would also sell avgas from the Baytown refinery directly to the Corporation. (*Id.* at A000501–02).

The third contract was between Standard Oil of Louisiana and the Defense Supplies Corporation and was effective from February 16, 1943. (P-54). This third contract incorporated by reference the terms and provisions in the 1942 Master Suppliers Contract for the production of avgas at the Baton Rouge refinery for sale to the Corporation. (*Id.*).

The Master Suppliers Contract contained the following cost-reimbursement provision:

Buyer shall pay in addition to the prices as established in Sections IV and V hereof, any new or additional taxes, fees, or charges, other than income, excess profits, or corporate franchise taxes, which Seller or its Suppliers may be required by a

¹⁸ Exxon presented credible evidence that there were additional supply contracts between the federal government and Humble Oil for other petroleum products, but Exxon did not submit the contracts or contract language addressing indemnification.

municipal, state or federal law in the United States or any foreign country to collect or pay by reason of the production, manufacture, sale or delivery of the commodities delivered hereunder.

(P-52 at A000491). The two other wartime avgas contracts, one for the Baytown facility and the other for the Baton Rouge facility, contained the same cost-reimbursement provisions. (P-53 at A000513, P-54 at A000519–20).

As the court explained in the Phase 2 opinion, “[b]ased on the reasoning in [*Shell Oil Co. v. United States*, 130 Fed. Cl. 8 (2017) (“*Shell IV*”)], allocating 100 percent of the response costs to the United States and the reasoning in [*Shell Oil Co. v. United States*, 896 F.3d 1299 (Fed. Cir. 2018) (“*Shell V*”)], affirming that allocation, the parties’ allocation of liability in the avgas-production contracts weighs in favor of imposing a larger equitable share of the cleanup costs on the United States.” *Exxon II*, 335 F. Supp. at 946. In the *Shell* cases, the Federal Circuit held that identical language required “the government to indemnify the Oil Companies for CERCLA costs incurred ‘by reason of’ the avgas contracts.” *Shell Oil Co. v. United States*, 751 F.3d 1282, 1293 (Fed. Cir. 2014). The Federal Circuit interpreted “charges” to include “costs” and found that the plain language of the contract provision meant that “CERCLA costs are ‘charges’ within the meaning of the relevant contract provision[.] The avgas contracts promise reimbursement of ‘any new or additional . . . charges’ the government imposes on the Oil Companies ‘by reason of the production, manufacture, sale or delivery of [avgas].’” *Id.* This court follows the reasoning of the Federal Circuit and its holding that the avgas contracts require the government to reimburse Exxon for CERCLA charges incurred “by reason of the production, manufacture, sale or delivery of [avgas].” *See id.* at 1292.

The Baytown Ordnance Works “operating contract” contained a cost-reimbursement provision as well. That provision stated:

The Government shall bear all cost and expense of every character and description incurred by the Contractor, when approved or ratified by the Contracting Officer, in connection with the design, construction, equipping and operating of said Plant, or any part thereof (including equipment, alterations, maintenance and closing down), which costs and expenses shall include but shall not be limited to the following items, to wit:

(P-139 at A001027). This provision shows that the government intended to reimburse Exxon's predecessors for all "cost and expense" related to the "operating" of the Baytown Ordnance Works, which includes the CERCLA costs Exxon has incurred and will incur to remediate the site.

The court finds that Mr. White's avgas contract calculations for the Baytown and Baton Rouge facilities are consistent with the approach applied in *Shell*. These cases recognize that avgas and the slate of products related to, or necessitated by, the production of avgas, are covered under the avgas contracts. (Docket Entry No. 293 at 117–18; Docket Entry No. 327 at 222–28). Mr. White's CERCLA and contract allocations for the Baytown and Baton Rouge facilities follow the "one facility" approach described in *Exxon I* and are part of this court's findings and conclusions.

(5) The Post-War Waste-Handling Improvements

The refineries' post-war waste-handling improvements were discussed in detail in Section II. *See supra* Section II.B.2.b). The court's 2018 opinion found and concluded that, "based on the present record, it is clear that the United States has undervalued the benefits and allocation impact of Exxon's post-wartime waste-reduction measures." *Exxon II*, 335 F. Supp. 3d at 948. The full record, including the evidence presented since 2018, is consistent with that finding and conclusion, particularly in light of the allocation method the government proposed in the bench trial. While the data may not be perfect, there is ample, credible evidence showing the numerous waste-improvement programs implemented in the Baytown and Baton Rouge refineries after the period of federal involvement, which the government did not credit in its allocation model. This factor supports increasing the share of the remediation costs allocated to the government.

5. Findings and Conclusions Applying the Equitable Factors

The court finds and concludes that the government's allocation is as follows: at Baytown, the government is liable under CERCLA for an allocated share of 24.67 percent for past response costs incurred at the refinery and 36.54 percent for past response costs incurred at the Baytown Ordnance Works / Tankfarm 3000 Area. At Baton Rouge, the government is liable under CERCLA for an allocated share of 14.4 percent for past response costs incurred at the refinery.

The court adopts Mr. White's production-based allocation, but, based on the equitable factors discussed above, the court reduces the government's allocation for the remediation costs at each facility by five percent. The court finds and concludes that this reduction is appropriate based on the government's role at the refineries compared to Exxon's role, and based on the limitations of measuring the effect of the waste-processing improvements achieved from the 1950s through the 1980s. The court does not reduce the allocation for the Baytown Ordnance Works because of the government's ownership of the site.

C. Prejudgment Interest, Run Rates, and Consultant Costs

The court's Phase 2 opinion issued in 2018 held that an award of prejudgment interest was premature because the court had not equitably allocated the costs among the parties; an award of run rate costs was premature because Exxon's claimed costs for the run rate are estimates of its costs between 2015 and 2019; and an award of consultant investigation costs was premature because Exxon had not produced invoices, proof of payment, or other documents for these costs. *Exxon II*, 335 F. Supp. 3d at 930. Because the court has now equitably allocated the costs between the parties, and they have stipulated to the proof of payment for these costs, these three issues can now be addressed.

First, the government must pay interest on the allocated amounts at the rate specified in section 107(a) of CERCLA, 42 U.S.C. § 9607(a), beginning on July 15, 2004 or the date of the expenditure concerned, whichever is later, and running to and including the date of payment. (Docket Entry No. 339 at ¶ 687; Docket Entry No. 340-3 at ¶ 5).

Second, the parties stipulated that the “run-rate” costs Exxon has estimated at the Baytown and Baton Rouge facilities from 2015 to 2019 are properly treated as future costs, rather than as past response costs. These costs are not included in the court’s quantification of recoverable past response costs incurred through December 2014 and the associated prejudgment interest. The parties agree that, in the event the court enters a declaratory judgment of liability for future costs, that judgment will specify that reimbursements of future costs incurred in 2015 to 2019 will include prejudgment interest. (Docket Entry No. 261 at 16).

Third, Exxon did not raise the issue of consultant costs at trial or in its posttrial briefs. In its proposed findings of fact and conclusions of law, Exxon stated that it had incurred \$250,000 in potentially responsible parties investigations at Baytown and Baton Rouge. (Docket Entry No. 261-4 at ¶¶ 635, 637). The government disputed this figure, arguing that “Exxon has never done more than state this figure.” (*Id.*). Neither party addressed this issue at the bench trial or in posttrial briefing. The court will not consider this issue.

D. Declaratory Judgment

In the 2018 Phase 2 opinion, the court held that it would enter a declaratory judgment assigning the government its share of the future cleanup costs at the units where Exxon has already incurred past remediation costs, based on the government’s share of the past costs the court determined at this Phase 3 bench trial. *Exxon II*, 335 F. Supp. 3d at 949. The court declined to enter a declaratory judgment setting the ultimate amount the government would have to pay, or to

enter a declaratory judgment that Exxon is entitled to recover some portion of the future costs related to remediation activities at the adjacent waterbodies and the underlying sediments in those bodies, where Exxon has not yet incurred any past remediation costs. *Id.* at 950.

In a cost-recovery action under section 107 of CERCLA, “the court shall enter a declaratory judgment on liability for response costs or damages that will be binding on any subsequent action or actions to recover further response costs or damages.” 42 U.S.C. § 9613(g)(2). A court will award a declaratory judgment setting a percentage liability for future response costs in contribution actions as well. *See, e.g., Boeing Co. v. Cascade Corp.*, 207 F.3d 1177, 1191–92 (9th Cir. 2000) (affirming the district court’s decision to allocate a cleanup site’s future costs and past costs in the same way because the record disclosed enough facts to determine each company’s responsibility for the contamination, even if the amounts of the future costs were unknown); *Tosco Corp. v. Koch Indus., Inc.*, 216 F.3d 886, 897 (10th Cir. 2000) (“[F]uture response costs are likely to be incurred, but the exact amount remains unknown, a judgment on proportional liability is an appropriate remedy.”).

Now that the court has determined the equitable allocation, the record is sufficient to allow the court to enter a declaratory judgment assigning the government the same share of the future remediation costs at the units where Exxon has already incurred past remediation costs, as determined in this opinion. Under the parties’ stipulation, the declaratory judgment applies also to Exxon’s run-rate costs. (*See* Docket Entry No. 261 at 16).

The court will not enter a declaratory judgment for the remediation costs for the adjacent waterbodies or in units where Exxon has not already incurred past response costs, as described in this bench trial. As the court explained in the Phase 2 opinion, the facts necessary to reliably and equitably allocate responsibility for the costs to remediate the contamination in the adjacent

waterbodies are not sufficiently developed. *Exxon II*, 335 F. Supp. 3d at 950. The court would have to speculate beyond what the case law and statute permit. A declaratory judgment allocating future costs to clean up the contamination in the adjacent waterbodies and the sediments they contain, and other areas of contamination for which Exxon has not yet determined the amount and source of the contamination, taken response actions, or incurred past cleanup costs, is premature.

Nor will the court enter a declaratory judgment allocating future costs at the units where Exxon has not provided evidence of past response costs. At Baytown, these units are the: Solid Waste Management Unit 64 (the landfill near the Velasco Street Ditch); Solid Waste Management Unit 71 (Old Separator 12); Solid Waste Management Unit 72 (Sludge Pit); Solid Waste Management Unit 73 (Sludge Pit); and Solid Waste Management Unit 74 (Separator 1). At Baton Rouge, these units are the: Solid Waste Management Unit 19 (API Oil /Water Separators); Solid Waste Management Unit 28 (Propane Storage Area Landfill); Solid Waste Management Unit 29 (Butyl Rubber Landfill); Solid Waste Management Unit 33 (North Batture Landfill & Burn Pit). The court has found, or the parties agree, that a federal nexus exists at all of these sites, but the facts are insufficient to assess what portion of the cleanup costs is attributable to the federal nexus. When those facts are available — when and if those costs are incurred — the government should have the chance to review and challenge the response costs. Even though the court does not specifically allocate these costs, the framework established in the court’s rulings should serve as a guide for the parties to do so.

E. The Insurance Offset

In the 1990s, Exxon sued its insurers to recover its environmental cleanup costs at hundreds of thousands of sites across the United States. In the North American Coverage Case, Exxon argued that its insurance policies covered environmental cleanup costs at numerous refineries,

including at the Baytown and Baton Rouge facilities. Exxon eventually settled that case for approximately \$269 million. (Docket Entry No. 338 at 2). Exxon and the government dispute the effect of this settlement payment on Exxon's CERCLA contribution claim against the government. The government's position in this litigation is that Exxon should offset the Coverage Case settlement money it received for the two refineries on a dollar-for-dollar basis.

Exxon argued that the government's insurance offset claim should be dismissed on two grounds: (1) Exxon will not get a "double recovery" by retaining both the Coverage Case settlement payment and receiving the amounts allocated to the government in these CERCLA cases; and (2) the collateral source rule separately bars the government's insurance offset claim. (Docket Entry No. 338). The government's argument at this stage is that the court has already determined that a settlement offset is appropriate, and the only remaining issue is whether attorneys' fees should be deducted from that offset. To that question, the government says "no"; Exxon says "yes." (Docket Entry No. 340-2 at 4).

In Phase 2, the government moved for summary judgment on the propriety of a settlement offset. (Docket Entry No. 202). The court explained that CERCLA's "general policy against double recovery," including from settlements, is an equitable factor entitled to significant weight. *Litgo N.J. Inc. v. Comm'r N.J. Dep't of Env'tl. Prot.*, 725 F.3d 369, 391 (3d Cir. 2013). Allowing a CERCLA claimant "to recoup more than the response costs he paid out of pocket flies in the face of CERCLA's mandate to apportion those costs equitably among liable parties." *Friedland v. TIC-The Indus. Co.*, 566 F.3d 1203, 1207 (10th Cir. 2009). Courts have discretion as to how to treat insurance-settlement offsets. See *NCR Corp. v. George A. Whiting Paper Co.*, 768 F.3d 682, 708 (7th Cir. 2014) ("*Friedland* affirms that any level of double recovery is inequitable in CERCLA contribution actions, and that ignoring insurance settlements when it would lead to double recovery

is inconsistent with the statute's purpose. It does not otherwise establish a bright-line rule for how a court should treat insurance settlements.”). The court granted the government's motion in part, ruling that a settlement offset was proper, but that it was premature to decide the amount without the evidence the bench trial could provide. *Exxon II*, 335 F. Supp. 3d at 923.

The court now has that evidence. Both parties have cited case law holding that the collateral source rule does not apply in CERCLA cases. *See NCR Corp.*, 768 F.3d at 707; *Friedland*, 566 F.3d at 1209. Courts have consistently held that the goals of CERCLA are not achieved by a party receiving a “double recovery.”¹⁹

The government relies on *Friedland v. TIC-The Industrial Company*, 566 F.3d 1203, 1204 (10th Cir. 2009), in which the plaintiff, a former director and president of a mining company, settled CERCLA claims with the federal and state governments for \$20,723,181, but spent approximately \$28 million on legal fees in the process. The plaintiff sued and received payment from his insurers of a confidential amount. *Id.* at 1204–05. The plaintiff then brought a CERCLA contribution action against the defendants, two companies found to have contributed to the contamination, arguing that the amount he sought should not be offset by the amounts he had received in the settlement with the federal government and state government because that amount could be allocated to covering his \$28 million defense costs. *Id.* at 1205. The Tenth Circuit disagreed. *Id.* at 1209–10. The court explained that the settlement agreements did “not expressly or impliedly allocate the settlement money toward amounts [the plaintiff] paid in settling the

¹⁹ Exxon revives its collateral source rule claim, arguing that it is available in contract actions. (Docket Entry No. 338 at 4). Exxon argues that because the avgas contracts allocated liability for CERCLA costs to the government, it would “be inconsistent with the Parties’ contractual intent” to apply an offset for the Coverage Case settlement proceeds. (*Id.*). Because the court finds that no insurance offset is necessary when, as here, there is no double recovery, the court need not reach the issue of whether the collateral source rule may be applied in CERCLA cases in which there is also a contractual right to indemnification.

underlying litigation on the one hand and for legal defense costs on the other.” *Id.* at 1210. The court noted that because “attorneys’ fees are not recoverable in CERCLA contribution actions,” the “settling parties should therefore make any variance from the statute absolutely clear.” *Id.* at 1211.

Exxon relies on *NCR Corp. v. George A. Whiting Paper Co.*, 768 F.3d 682, 708 (7th Cir. 2014), which distinguished *Friedland* and held that the plaintiff-contributor’s insurance proceeds should not be offset against the payments from a CERCLA contribution claim in part because of the defense costs incurred in bringing that claim. The Seventh Circuit affirmed a district court ruling that “rejected as inequitable a reading of *Friedland* that would require all proceeds from an undifferentiated insurance settlement to cover common liability costs.” *Id.* The district court explained that “at least some” of the settlement “was for defense costs, which are not subject to recovery in contribution,” especially because the insurance policy included coverage for both direct liability and defense costs. *Id.* The district court considered the maximum amount of the settlement that could be allocated to liability and determined that “the combined amount of liability insurance and contribution would not cover [the plaintiff’s] full liability, so there was no danger that [the plaintiff] would recover more than 100% of its share.” *Id.* The Seventh Circuit affirmed, finding that *Friedland* did not “establish a bright-line rule for how a court should treat insurance settlements,” and that “[t]he governing rule is equity.” *Id.*

Exxon admitted during Phase 2 that no portion of its insurance settlement was allocated to the reimbursement of litigation fees. (See Docket Entry No. 209 at 28). But Exxon argues that it will not obtain a “double recovery” from the offset “unless the Court allocates to the United States more than 94 percent (that is, more than \$48.1 million) of Exxon’s claimed past costs of approximately \$51.0 million at Baytown, or more than 87 percent (more than \$22.7 million) of

Exxon’s claimed past costs of \$26.0 million at Baton Rouge.” (Docket Entry No. 261 at 12 n.1). The court has allocated far less than those amounts to the government, removing the possibility of a double recovery with no offset for the Coverage Case insurance proceeds. The court finds that an insurance offset is unnecessary and inappropriate.²⁰ This outcome is consistent with both *Friedland* and *NCR* because it does not allow Exxon a double recovery.

III. Conclusions of Law

Congress enacted CERCLA in 1980 “in response to the serious environmental and health risks posed by industrial pollution.” *Burlington N.*, 556 U.S. at 602; *Bestfoods*, 524 U.S. at 558. “The Act was designed to promote the timely cleanup of hazardous waste sites and to ensure that the costs of such cleanup efforts were borne by those responsible for the contamination.” *see also Waldburger*, 573 U.S. at 4 (2014) (quoting *Burlington N.*, 556 U.S. at 602). As amended by the Superfund Amendments and Reauthorization Act of 1986 (“SARA”), Pub. L. No. 99-499, 100 Stat. 1613, CERCLA provides several alternative means for cleaning up contaminated property. Section 107(a)(4) states that “covered persons”—“potentially responsible parties”—may be liable for costs the federal or state government incur in responding to the contamination and for response costs incurred by “any other person.” 42 U.S.C. § 9607(a)(4)(A)–(B). Section 107(a)(4) is part of the original statute enacted in 1980. Two contribution provisions, §§ 113(f)(1) and 113(f)(3)(B), were added in 1986 as part of the Amendments and Reauthorization Act.

²⁰ The government argues that Exxon’s position on the insurance offset “asks the Court to reverse its nearly two-year old decision on this legal question.” (Docket Entry No. 340-2 at 1). The court is not revisiting its 2018 opinion, but merely finding that after a full presentation of the facts, an insurance offset is unnecessary. As the court explained in its 2018 opinion, “there [were] genuine factual disputes material to determining the proper offset amount for the Coverage Case settlement.” *Exxon II*, 335 F. Supp. 3d at 923. Those factual disputes have been resolved, and no double recovery is present. The resolution of those factual disputes allows the court to determine that the proper offset amount is zero.

Section 107(a) identifies four categories of potentially responsible parties who may be liable for the costs to clean up hazardous substances. 42 U.S.C. § 9607(a). The categories are: (1) owners and operators of facilities at which hazardous substances are located; (2) past owners and operators of these facilities when the disposal of hazardous substances occurred; (3) persons who arranged to dispose of or treat hazardous substances; and (4) transporters of certain hazardous substances. 42 U.S.C. § 9607(a)(1)-(4). Unless a statutory defense or exclusion applies, covered persons are liable for “all costs of removal or remedial action incurred by the United States government or a State . . . not inconsistent with the national contingency plan,” and “any other necessary costs of response incurred by any other person consistent with the national contingency plan,” 42 U.S.C. § 9607(a). The statute defines “person,” “facility,” “disposal,” “release,” and “environment.” CERCLA also provides a narrow set of defenses to liability that may arise under § 107(a), none of which apply in these cases.

The court incorporates its conclusions of law from the prior summary judgment opinions. In 2015, the court ruled on the parties’ cross-motions for partial summary judgment, holding that:

- the three-year statute of limitations under § 113(g)(2), 42 U.S.C. § 9613(g)(2), is applicable to Exxon’s claims;
- § 113(f)(3)(B)’s contribution provision is Exxon’s exclusive remedy to seek cleanup costs incurred in response to administrative settlements with the State of Texas;
- Exxon’s agreed orders with the State of Texas are “administrative settlements” under § 113(f);
- the refinery and chemical plant at each site are a single “facility” under CERCLA;
- Exxon and the government were CERCLA owners and operators of the chemical plants at both facilities;
- the government was not a CERCLA owner and operator of either refinery; and
- Exxon was entitled to a declaratory judgment that “the United States is liable for its equitable share of past and future cleanup costs incurred at the Baytown and Baton Rouge sites.”

Exxon I, 108 F. Supp. 3d at 486. These conclusions meant that both Exxon and the government bear some share of the liability for the cleanup costs at the Baytown and Baton Rouge facilities.

In 2018, the court ruled on the parties' cross-motions for partial summary judgment, holding that:

- Exxon's cleanup costs at the two Baytown Facility Operations Areas were "necessary costs of response" eligible for CERCLA recovery;
- Exxon's response actions at the five Baytown units and at the three Baton Rouge units were appropriately characterized as a single "removal" action at each facility, which would not be barred by the statute of limitations in 42 U.S.C. § 9613(g);
- Exxon "substantially complied" with the National Contingency Plan for three of the Baytown units and two of the Baton Rouge units;
- a deduction of the insurance-settlement proceeds Exxon received in a different case is appropriate if needed to prevent double recovery;
- the "production-based" analysis is the appropriate equitable allocation methodology to use in this case; and
- Exxon was entitled to a declaratory judgment that Exxon is entitled to recover future cleanup costs associated with the units at which Exxon has already incurred costs.

Exxon II, 335 F. Supp. 3d at 908–50. These conclusions set out the basis to determine each party's share.

The issue in Phase 3 is the amounts allocated. Allocation under CERCLA is a matter of equity left to the district court's discretion. Section 113, added in 1986 as part of SARA, contains a subsection entitled "Contribution." This subsection states:

Any person may seek contribution from any other person who is liable or potentially liable under [§ 107(a)], during or following any civil action under [§§ 106 or 107(a)]. . . . In resolving contribution claims, the court may allocate response costs among liable parties using such equitable factors as the court determines are appropriate. . . .

42 U.S.C. § 9613(f)(1).

As one court has explained:

[T]he language of section 9613(f) clearly indicates Congress's intent to allow courts to determine what factors should be considered in their own discretion without requiring a court to consider any particular list of factors. . . . [I]n any given case, a court may consider several factors, a few factors, or only one determining factor . . . , depending on the totality of the circumstances presented to the court.

Env'tl. Transp. Sys., Inc. v. ENSCO, Inc., 969 F.2d 503, 509 (7th Cir. 1992); *see also Beazer East, Inc. v. The Mead Corp.*, 412 F.3d 429, 446 (3d Cir. 2005) ("Congress intended to grant the district

courts significant flexibility in determining equitable allocations of response costs, without requiring the courts to prioritize, much less consider, any specific factor.”); *Shell Oil Co.*, 13 F. Supp. 2d at 1020 (“Courts have consistently recognized the broad discretion afforded by this statute to the District Court both in the selection of equitable factors to be applied and in the application of those factors.”); *United States v. R.W. Meyer, Inc.*, 932 F.2d 568, 572–73 (6th Cir. 1991) (“No exhaustive list of criteria need or should be formulated. However, in addition to the [Gore Factors], the court may consider the state of mind of the parties, their economic status, any contracts between them bearing on the subject, any traditional equitable defenses as mitigating factors[,] and any other factors deemed appropriate to balance the equities in the totality of the circumstances.”) (footnote omitted).

The court also looked at the knowledge and acquiescence of the parties in the contamination-causing activities; the value of the activities to the national defense efforts; the parties’ role at the refineries and chemical plants; the parties’ intent to allocate liability; and post-war waste-handling improvements. *Exxon II*, 335 F. Supp. 3d at 942–48.

Using the full record established by the evidence presented in the prior motions and in the bench trial, the court applies the Gore and Torres factors to consider the equities of the allocations sought. The court finds and concludes that: the government’s knowledge and acquiescence in the contamination-causing activities supports a substantial allocation of the response costs to the government; the value of the avgas and other war product production to the national defense efforts supports a significant allocation of the response costs to the government; the government’s role at the refineries, as opposed to the plancors, supports a lower equitable share for the government; the cost-reimbursement provision in the avgas contracts demonstrated that the government intended to reimburse the refineries’ clean-up costs related to avgas, supporting a substantial allocation of

the response costs to the government; and the refineries' substantial post-war waste-handling improvements supports an increased share of the remediation costs allocated to the government.

The court finds and concludes that, after considering all the equitable factors, the proper allocation in this case is as follows: at Baytown, the government is liable under CERCLA for an allocated share of 24.67 percent for past response costs incurred at the refinery and 36.54 percent for past response costs incurred at the Baytown Ordnance Works / Tankfarm 3000 Area. At Baton Rouge, the government is liable under CERCLA for an allocated share of 14.4 percent for past response costs incurred at the refinery.

Exxon is entitled to recover prejudgment interest on the amount of its past response costs at the Baytown and Baton Rouge Sites that are deemed recoverable from the United States at the interest rate established under Section 107(a)(4)(D) of CERCLA, 42 U.S.C. § 9607(a)(4)(D). This interest is computed in regard to the Baytown Site beginning on the date of July 15, 2004, and in regard to the Baton Rouge Site beginning on the date of January 6, 2010.

In a cost-recovery action under section 107 of CERCLA, "the court shall enter a declaratory judgment on liability for response costs or damages that will be binding on any subsequent action or actions to recover further response costs or damages." 42 U.S.C. § 9613(g)(2). Courts will award a declaratory judgment setting a percentage liability for future response costs in contribution actions as well. *See, e.g., Boeing Co.*, 207 F.3d at 1191-92 (9th Cir. 2000) (affirming the district court's decision to allocate a cleanup site's future costs and past costs in the same way because the record disclosed enough facts to determine each company's responsibility for the contamination, even if the amounts of the future costs were unknown); *Tosco Corp.*, 216 F.3d at 897 (10th Cir. 2000) ("[F]uture response costs are likely to be incurred, but the exact amount remains unknown, a judgment on proportional liability is an appropriate remedy."). Now that the court has

determined the equitable allocation, the record is sufficient to allow the court to enter a declaratory judgment assigning the government the same share of the future remediation costs at the units where Exxon has already incurred past remediation costs, as determined in this opinion. As stipulated by the parties, the declaratory judgment will apply to Exxon's run-rate costs. (Docket Entry No. 261 at 16). The declaratory judgment will not extend to the adjacent waterbodies or units where Exxon has not already incurred past response costs.

CERCLA prohibits double recovery; a CERCLA defendant would be entitled to offset any judgment by an appropriate amount if a CERCLA plaintiff has received insurance proceeds for the same expenses asserted in a CERCLA action. Here, however, Exxon's insurance proceeds relating to the two facilities at issue, when combined with the award against the government, do not approach a double recovery, as Exxon still bears the vast majority of expenses associated with the cleanups at these two sites. No insurance offset is necessary or appropriate. The government's insurance offset claim for both sites is dismissed as a matter of law.

IV. Order

Consistent with the court's findings of fact and conclusions of law, the court will issue judgment, in accordance with Federal Rule of Civil Procedure 58. That judgment will require the government to pay ExxonMobil as follows:

Baytown:

Allocation of Past Response Costs Through 2014 and Accrued Prejudgment Interest:

- Refinery-Related Unit Past Costs: The government allocated share is 24.67 percent for the past response costs of \$45,567,403.00 and interest accrued of \$9,950,216.00. The government is responsible for:

The government's allocated share of past costs: \$ 11,241,478

The government's allocated share of interest: \$ 2,454,718

Total **\$ 13,696,197**

- Former Baytown Ordnance Works/Tankfarm 3000 Area Past Costs: The government's allocated share is 36.54 percent for the past response costs of \$5,481,340.00 and interest accrued of \$1,355,835.00. The government is responsible for:

The government's allocated share of past costs: \$ 2,002,694

The government's allocated share of interest: \$ 495,376

Total **\$ 2,498,070²¹**

- Total Government Allocation for the Combined Baytown and Baytown Ordnance Works Past Costs through 2014 and Prejudgment Accrued Interest:

The government's allocated share of past costs: \$ 13,244,172

The government's allocated share of interest: \$ 2,950,094

Total **\$ 16,194,267**

Baton Rouge:

Allocation of Past Response Costs Through 2014 and Accrued Prejudgment Interest:

- Refinery-Related Unit Past Costs: The government's allocated share is 14.4 percent for the past response costs of \$26,046,130.00 and interest accrued of \$2,665,007.00. The government is responsible for:

The government's allocated share of past costs: \$ 3,750,643

The government's allocated share of interest: \$ 383,761

Total **\$ 4,134,404**

The total damage award in favor of Exxon is **\$20,328,670**. For the reasons set forth in the court's findings and conclusions, these amounts are not subject to an offset for insurance recovery by Exxon because there is no double recovery.

²¹ The court relies on the numbers provided by Exxon in its proposed final judgment. (Docket Entry No. 339-1).

In addition, the court will issue a declaratory judgment in favor of Exxon against the United States as a percentage allocation for costs incurred for units at which Exxon has already incurred past response costs as described in this bench trial for the period after filing suit through 2019 as follows:

Baytown:

- Costs for 2015–2019: The government’s allocated share is 24.67 percent for the refinery-related costs, and 36.54 percent for these Baytown Ordnance Works costs.

Baton Rouge:

- Costs for 2015–2019: The government’s allocated share is 14.4 percent for the refinery-related costs.

The court will issue a declaratory judgment in favor of Exxon against the government as a percentage allocation for units at which Exxon has already incurred past response costs, that the government is liable for future costs incurred from 2020 and beyond, as follows:

Baytown:

- Future Post-2019 Costs: The U.S. allocated share is 24.67 percent for the refinery-related costs, and 36.54 percent for these Baytown Ordnance Works costs.

Baton Rouge:

- Future Post-2019 Costs: The U.S. allocated share is 14.4 percent for the refinery-related costs.

The judgment does not foreclose future claims by Exxon for land-based units, areas of contamination, or waterbodies at or adjacent to the Baytown or Baton Rouge facilities for which costs have not yet been incurred by Exxon, but will be incurred in the future.

The end of the years of trial court litigation is in sight. World War II is long over. The pollution at issue has been, and will be, addressed. The parties and lawyers have worked hard and well to address these issues. The court hopes that this litigation can also, at least, end.

No later than **August 28, 2020**, Exxon is to submit a proposed final judgment, consistent with the findings and conclusions, after consulting with the government.

SIGNED on September 16, 2020, at Houston, Texas.

A handwritten signature in black ink, reading "Lee H. Rosenthal". The signature is fluid and cursive, with a long horizontal stroke extending from the end of the name.

Lee H. Rosenthal
Chief United States District Judge

APPENDIX A

Time Period		Cost	Share of Total Cost	CERCLA Allocation				Contract Allocation (Increment) to U.S.		Final Allocation (CERCLA + Contract) to the U.S.	
				Exxon		U.S.		Cost	Share of Total Cost	Cost	Share of Total Cost
				Cost	Share of Total Cost	Cost	Share of Total Cost				
A		B	C	D	E	F	G	H	I	J	K
1. BAYTOWN SITE ALLOCATION - REFINERY											
EARLY PERIOD	1920-01 - 1941-04	\$ 18,832,615	41.33%	\$ 18,832,615	41.33%	\$ -	0.00%	\$ -	0.00%	\$ -	0.00%
WORLD WAR II	1941-05 - 1945-08	\$ 7,851,171	17.23%	\$ 4,290,614	9.42%	\$ 3,560,557	7.81%	\$ 3,694,129	8.11%	\$ 7,254,686	15.92%
POST-WW2 PRE-KOREA	1945-09 - 1950-06	\$ 9,652,353	21.18%	\$ 7,957,128	17.46%	\$ 1,695,225	3.72%	\$ 1,511,616	3.32%	\$ 3,206,841	7.04%
KOREA	1950-07 - 1953-07	\$ 3,504,737	7.69%	\$ 1,977,718	4.34%	\$ 1,527,019	3.35%	\$ 758,069	1.66%	\$ 2,285,088	5.01%
POST-KO REA PLANDOR	1953-08 - 1955-06	\$ 1,235,455	2.71%	\$ 868,264	2.12%	\$ 267,251	0.59%	\$ 261,566	0.57%	\$ 528,817	1.16%
DELAY ONLY	1955-07 - 1958-12	\$ 1,397,156	2.87%	\$ 1,195,106	2.62%	\$ 112,050	0.25%	\$ 131,933	0.29%	\$ 243,983	0.54%
		\$ 28,550,873	51.68%	\$ 16,388,770	35.97%	\$ 7,162,103	15.72%	\$ 6,357,313	13.85%	\$ 13,519,416	29.67%
LATE PERIOD	1959-01 - 2015-12	\$ 3,183,915	6.99%	\$ 3,183,915	6.99%	\$ -	0.00%	\$ -	0.00%	\$ -	0.00%
TOTAL		\$ 45,567,403	100.00%	\$ 38,405,300	84.28%	\$ 7,162,103	15.72%	\$ 6,357,313	13.85%	\$ 13,519,416	29.67%
2. BAYTOWN SITE ALLOCATION - BOW											
EARLY PERIOD	1920-01 - 1941-04	\$ -	0.00%	\$ -	0.00%	\$ -	0.00%	\$ -	0.00%	\$ -	0.00%
WORLD WAR II	1941-05 - 1945-08	\$ 1,608,222	28.36%	\$ 643,688	11.74%	\$ 965,533	17.61%	\$ 625,583	11.49%	\$ 1,585,126	29.10%
POST-WW2 PRE-KOREA	1945-09 - 1950-06	\$ 2,223,897	40.57%	\$ 2,139,325	39.03%	\$ 84,572	1.54%	\$ -	0.00%	\$ 84,572	1.54%
KOREA	1950-07 - 1953-07	\$ 807,490	14.73%	\$ 484,494	8.84%	\$ 322,996	5.89%	\$ -	0.00%	\$ 322,996	5.89%
POST-KO REA PLANDOR	1953-08 - 1955-06	\$ 284,648	5.19%	\$ 284,648	5.19%	\$ -	0.00%	\$ -	0.00%	\$ -	0.00%
DELAY ONLY	1955-07 - 1958-12	\$ 301,168	5.49%	\$ 301,168	5.49%	\$ -	0.00%	\$ -	0.00%	\$ -	0.00%
		\$ 5,226,425	95.35%	\$ 3,853,324	70.30%	\$ 1,373,101	25.05%	\$ 625,583	11.49%	\$ 2,002,694	36.54%
LATE PERIOD	1959-01 - 2015-12	\$ 254,915	4.65%	\$ 254,915	4.65%	\$ -	0.00%	\$ -	0.00%	\$ -	0.00%
TOTAL		\$ 5,481,340	100.00%	\$ 4,108,239	74.95%	\$ 1,373,101	25.05%	\$ 625,583	11.49%	\$ 2,002,694	36.54%
3. BAYTOWN SITE ALLOCATION - REFINERY & BOW COMBINED											
EARLY PERIOD	1920-01 - 1941-04	\$ 18,832,615	36.89%	\$ 18,832,615	36.89%	\$ -	0.00%	\$ -	0.00%	\$ -	0.00%
WORLD WAR II	1941-05 - 1945-08	\$ 9,460,393	18.53%	\$ 4,934,303	9.67%	\$ 4,526,090	8.87%	\$ 4,323,722	8.47%	\$ 8,849,813	17.34%
POST-WW2 PRE-KOREA	1945-09 - 1950-06	\$ 11,876,250	23.28%	\$ 10,096,453	19.78%	\$ 1,779,797	3.49%	\$ 1,511,616	2.86%	\$ 3,291,413	6.45%
KOREA	1950-07 - 1953-07	\$ 4,312,227	8.45%	\$ 2,462,212	4.82%	\$ 1,850,015	3.62%	\$ 758,069	1.48%	\$ 2,608,084	5.11%
POST-KO REA PLANDOR	1953-08 - 1955-06	\$ 1,520,104	2.98%	\$ 1,252,853	2.45%	\$ 267,251	0.52%	\$ 261,566	0.51%	\$ 528,817	1.04%
DELAY ONLY	1955-07 - 1958-12	\$ 1,608,324	3.15%	\$ 1,496,274	2.93%	\$ 112,050	0.22%	\$ 131,933	0.26%	\$ 243,983	0.48%
		\$ 28,777,298	56.37%	\$ 20,242,094	39.65%	\$ 8,535,204	16.72%	\$ 6,986,906	13.69%	\$ 15,522,110	30.41%
LATE PERIOD	1959-01 - 2015-12	\$ 3,438,830	6.74%	\$ 3,438,830	6.74%	\$ -	0.00%	\$ -	0.00%	\$ -	0.00%
TOTAL		\$ 51,048,743	100.00%	\$ 42,513,539	83.28%	\$ 8,535,204	16.72%	\$ 6,986,906	13.69%	\$ 15,522,110	30.41%

Notes: See P-763 at BAYTOWN-017 for "1. Baytown Site Allocation - Refinery" data; see P-763 at BAYTOWN-035 for "2. Baytown Site Allocation - BOW". Data in Columns A through G, and I are taken directly from the source. Column H is the dollar value determined by multiplying Column I value by total cost for that area. Column J and K are simply the addition of their respective components (J = F + H), (K = G + I). Note that block 3, "3. Baytown Site Allocation - Refinery & BOW Combined" is the sum of block 1 (refinery) plus block 2 (BOW).

APPENDIX B

Time Period			Cost	Share of Total Cost	CERCLA Allocation				Contract Allocation (Increment) to U.S.		Final Allocation (CERCLA + Contract) to the U.S.	
					Exxon		U.S.					
					Cost	Share of Total Cost	Cost	Share of Total Cost	Cost	Share of Total Cost	Cost	Share of Total Cost
A		B		C	D	E	F	G	H	I	J	K
BATON ROUGE SITE ALLOCATION												
EARLY PERIOD	1910-01 - 1941-04	\$ 10,631,616	40.82%	\$ 10,631,616	40.82%	\$ -	0.00%	\$ -	0.00%	\$ -	0.00%	
WORLD WAR II	1941-05 - 1945-08	\$ 2,684,061	10.31%	\$ 1,610,436	6.18%	\$ 1,073,624	4.12%	\$ 1,405,285	5.40%	\$ 2,478,909.60	9.52%	
POST-WW2 PRE-KOREA	1945-09 - 1950-06	\$ 3,945,484	15.15%	\$ 3,231,777	12.41%	\$ 713,707	2.74%	\$ 1,070,560	4.11%	\$ 1,784,266.42	6.85%	
KOREA	1950-07 - 1953-07	\$ 1,758,812	6.75%	\$ 1,055,287	4.05%	\$ 703,525	2.70%	\$ 86,702	0.33%	\$ 790,226.80	3.03%	
		\$ 8,388,357	32.21%	\$ 5,897,501	22.64%	\$ 2,490,856	9.56%	\$ 2,562,547	9.84%	\$ 5,053,403	19.40%	
LATE PERIOD	1953-08 - 2015-12	\$ 7,026,157	26.98%	\$ 7,026,157	26.98%	\$ -	0.00%	\$ -	0.00%	\$ -	0.00%	
TOTAL		\$ 26,046,130	100.00%	\$ 23,555,274	90.44%	\$ 2,490,856	9.56%	\$ 2,562,547	9.84%	\$ 5,053,403	19.40%	

Notes: See P-763 at BATON ROUGE-017 for "Baton Rouge Site Allocation" data; Data in Columns A through G, and I are taken directly from the source. Column H is the dollar value determined by multiplying Column I value by total cost for that area. Column J and K are simply the addition of their respective components (J = F + H), (K = G + I).